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Sakuma et al.

(10) **Patent No.: US 6,264,099 B1**
(45) **Date of Patent: Jul. 24, 2001**

(54) **PACKAGING CARTON**

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(73) Assignee: **Suzuki Manufacturing, Ltd.** (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 5 days.

(21) Appl. No.: **09/613,505**

(22) Filed: **Jul. 10, 2000**

(51) **Int. Cl.**[7] **B65D 5/42**
(52) **U.S. Cl.** **229/169**; 229/125.35; 229/164; 229/186
(58) **Field of Search** 229/109, 125.35, 229/164, 169, 171, 186

(56) **References Cited**

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* cited by examiner

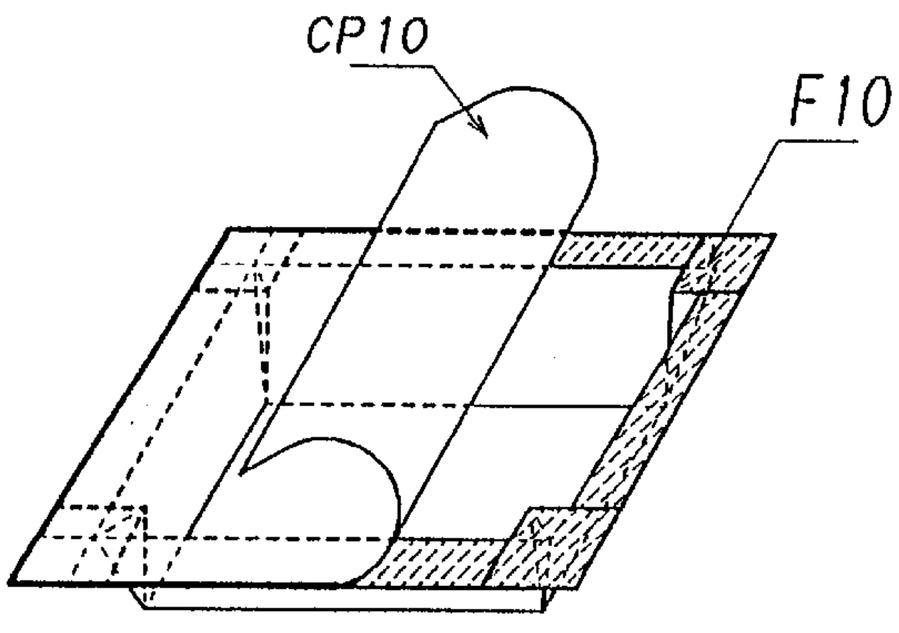
Primary Examiner—Gary E. Elkins

(74) *Attorney, Agent, or Firm*—Lorusso & Loud

(57) **ABSTRACT**

A packaging carton is made by folding a quadrilateral sheet **S1** in a polyhedron having specified length, width and height with a flat flange **F1** provided around its periphery so that a sealing cover can be bonded on the flange. The quadrilateral sheet comprises four inward folding lines **V1** to **V4** each being formed to pass two of four corner points C**1** to C**4** of a bottom plane **B1** of the polyhedron having the specified length and width, and four outward folding lines **M1** to **M4** each being formed to be in parallel with each of the four inward folding lines with a distance therefrom equal to the specified height, and to have a length equal to a distance between the two of the four corner points L**1** or L**2** on the inward folding line in parallel therewith. In a region formed at each corners of the quadrilateral sheet between two of four side planes SD**1** to SD**4** formed between the four inward folding lines and the four outward folding lines, respectively, the region comprises three outward folding lines **M5** to **M7** forming a triangle **T1** extending from a vertex **P1** at one of the corner points, two outward folding lines **M8** and **M9** each being formed to extend from each of the other two vertices **P2** and **P3** of the triangle in parallel with one of the four outward folding lines forming the side plane beyond the rest of the other two vertices, and two inward folding lines each being formed to extend from an end **G1** to **G8** of one of the four outward folding lines forming one of the side planes to one of the other two vertices near the end.

7 Claims, 14 Drawing Sheets



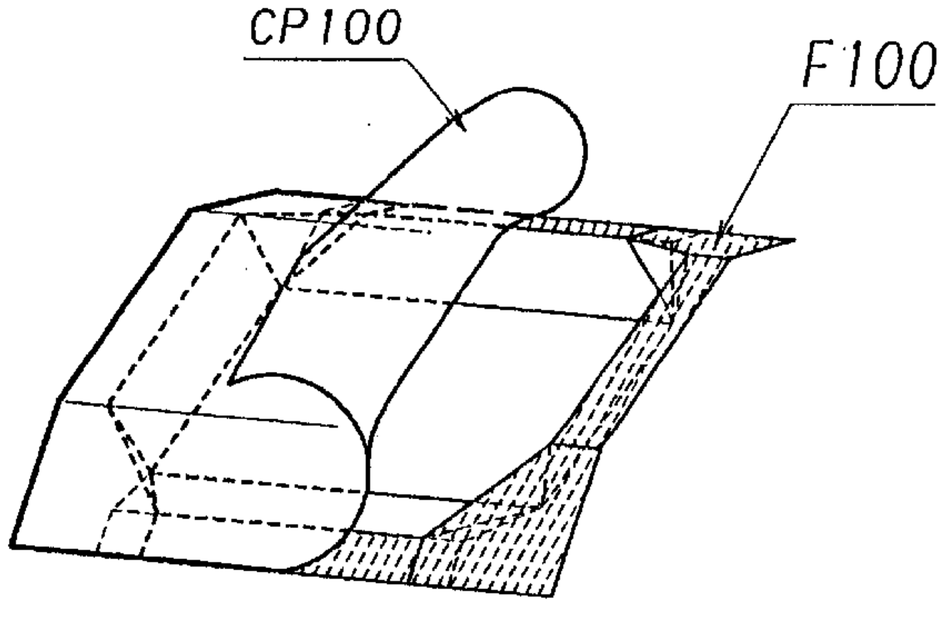


FIG. 1

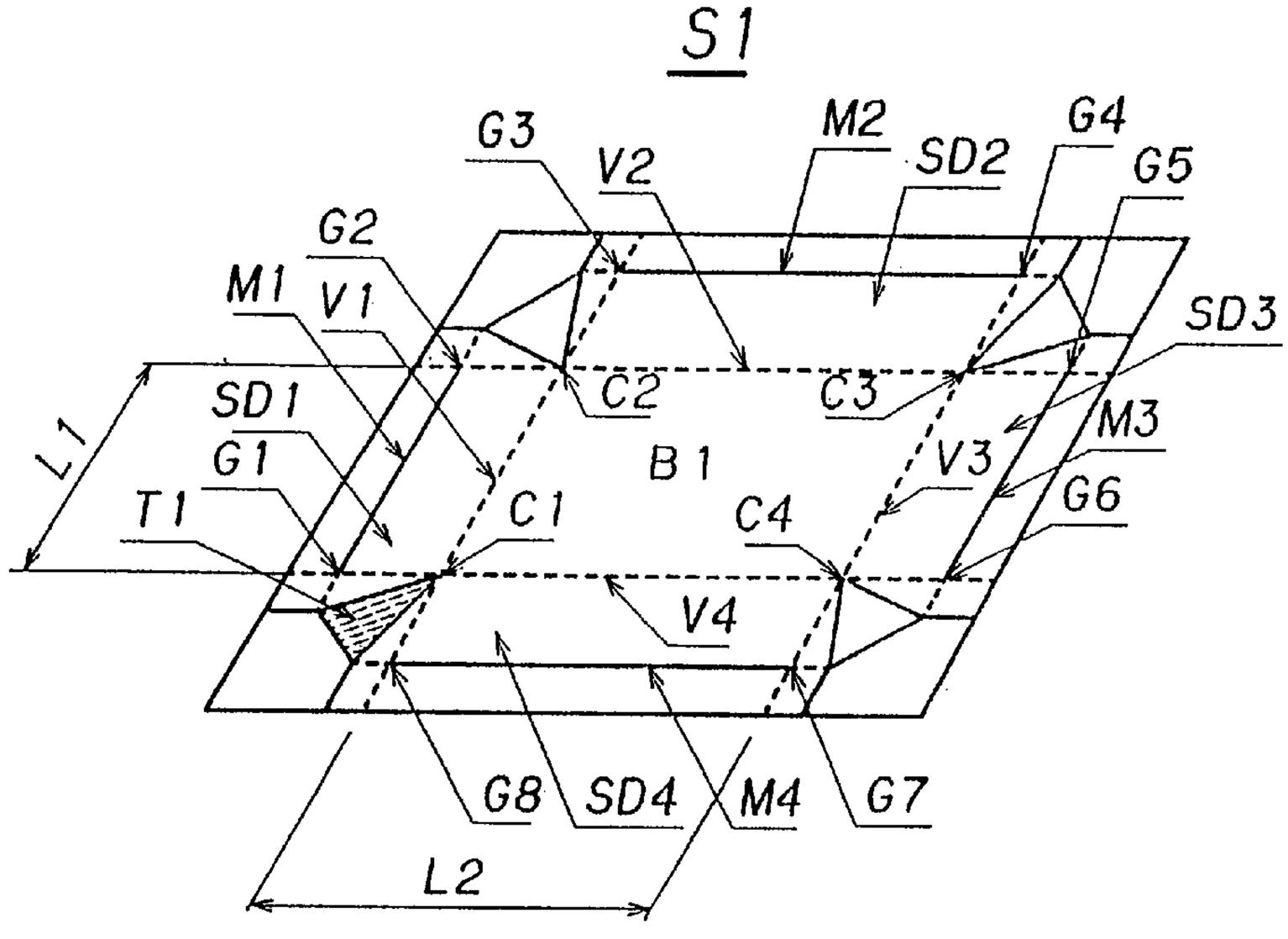

S1
G3
V2
M2
SD2
G4
G5
G2
M1
V1
SD3
L1
SD1
C2
C3
M3
G1
B1
V3
T1
C1
C4
G6
V4
G8
SD4
M4
G7
L2

FIG. 2

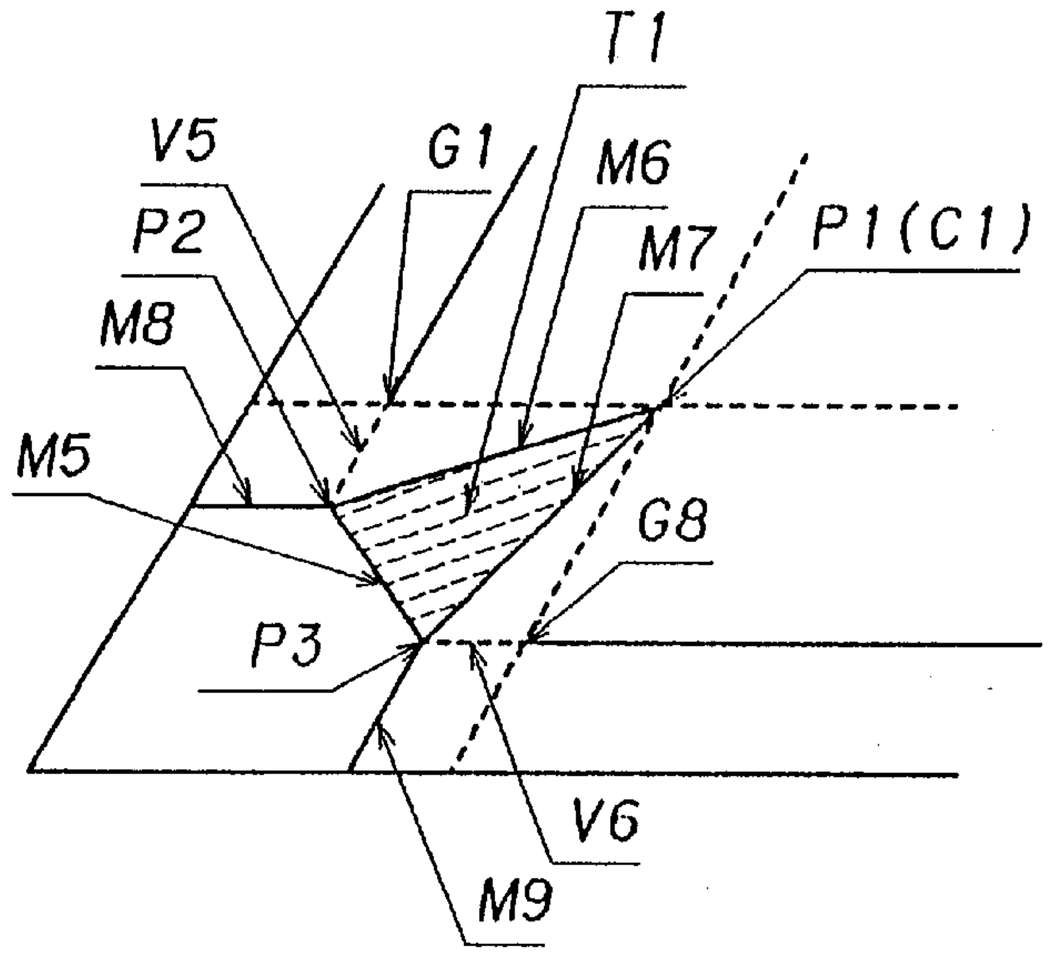

T1
V5
G1
M6
P2
M7
P1(C1)
M8
M5
G8
P3
V6
M9

FIG. 3

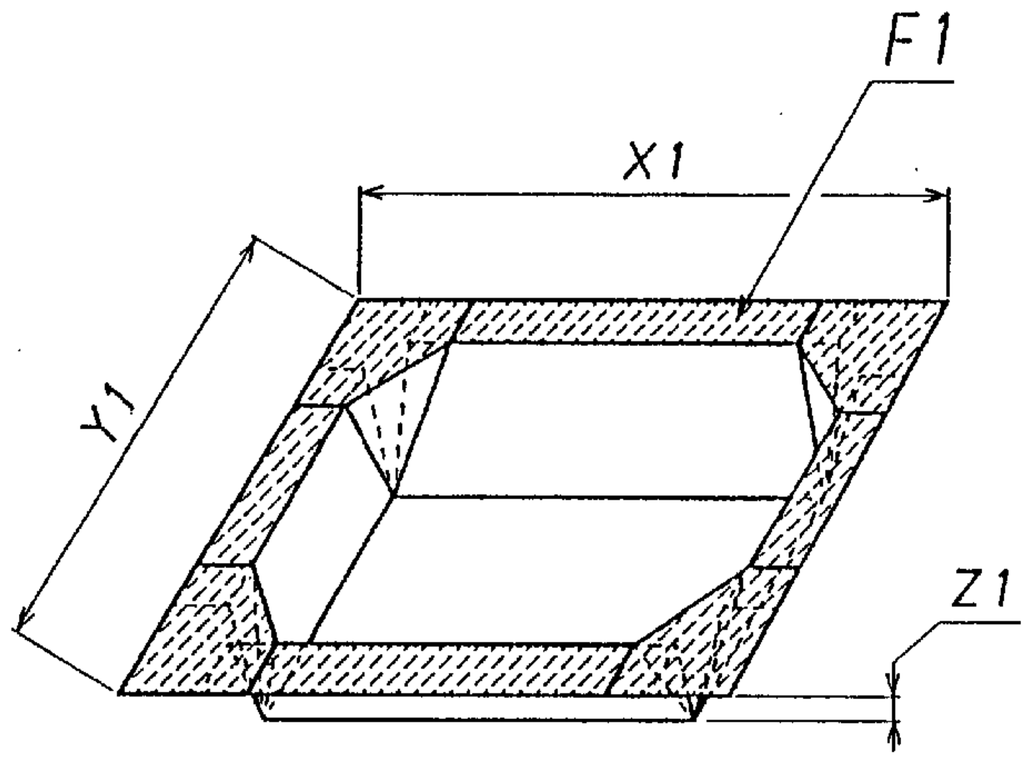


FIG. 5

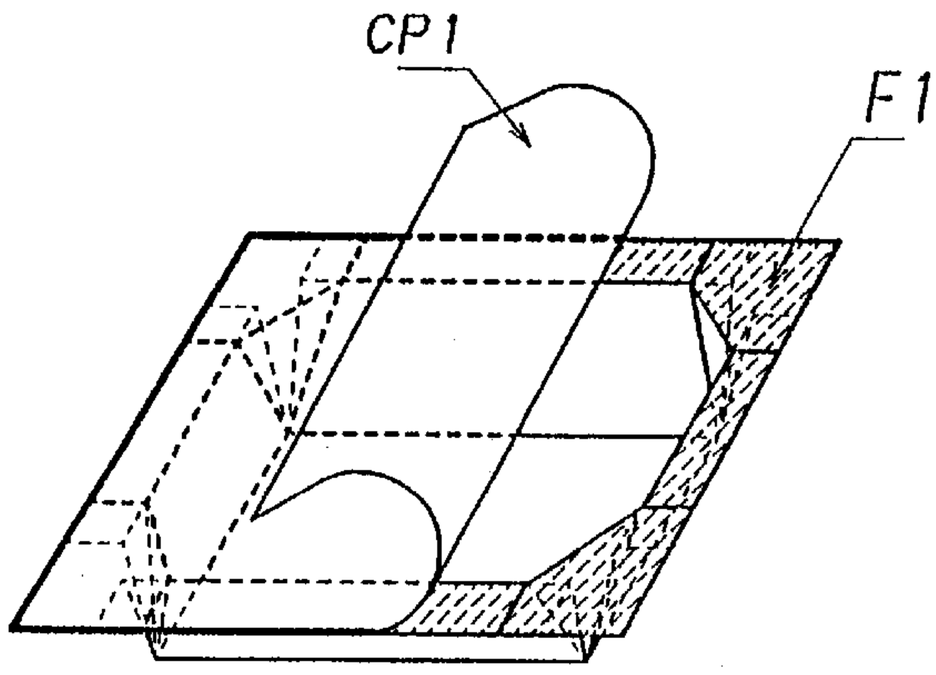


FIG. 8

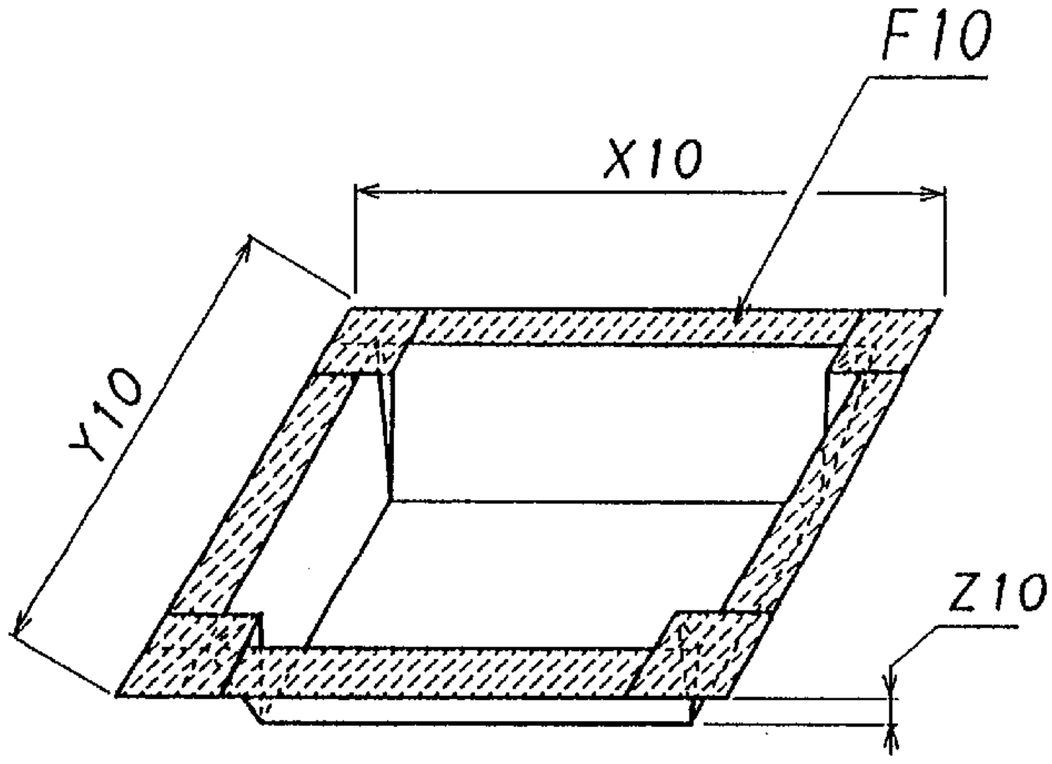


FIG. 4

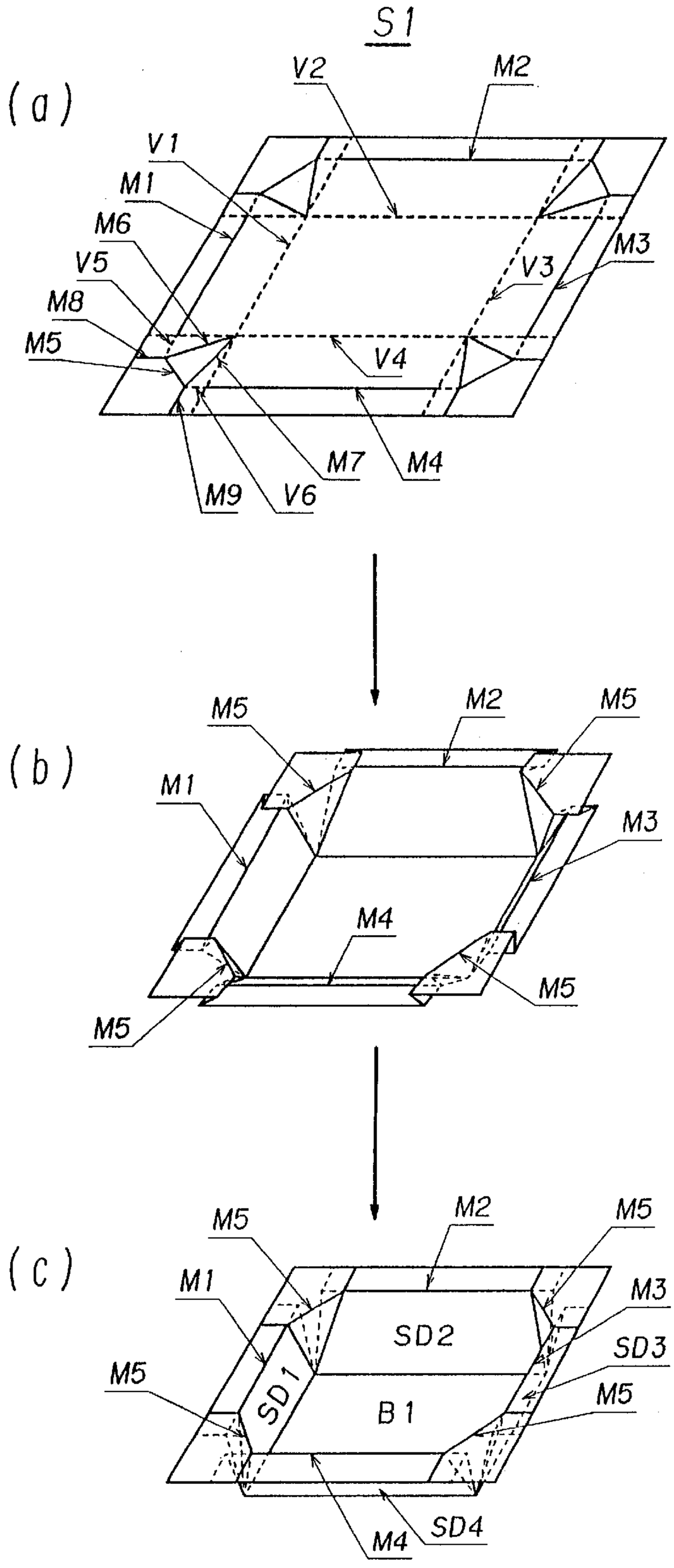

S1
(a)
V2
M2
V1
M1
M6
V5
M8
M5
M3
V3
V4
M7
M4
M9
V6
(b)
M5
M2
M5
M1
M3
M4
M5
M5
(C)
M5
M2
M5
M1
M3
SD2
SD3
M5
SD1
B1
M4
SD4

FIG. 6

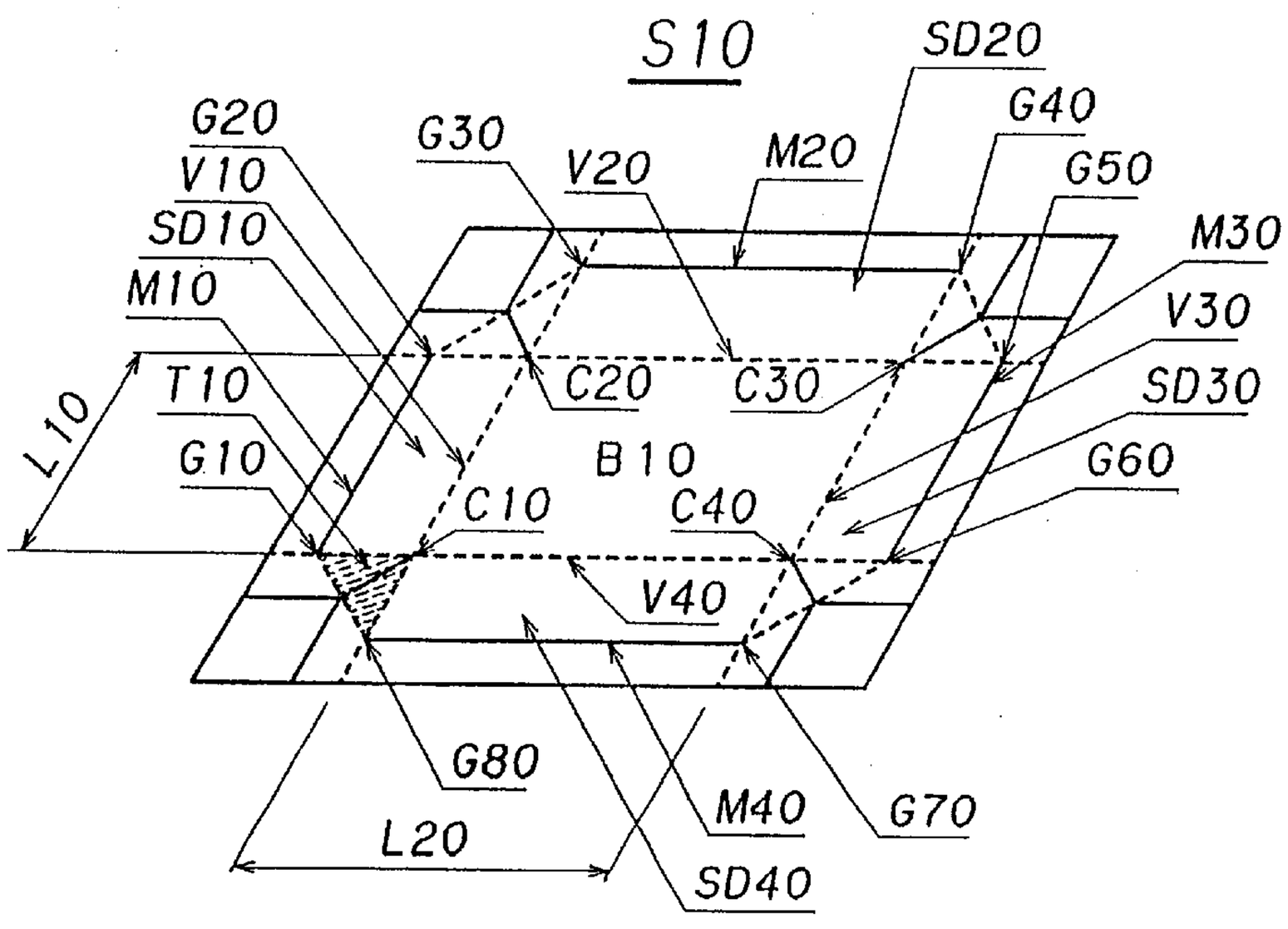

S10
SD20
G20
G30
V20
M20
G40
G50
V10
SD10
M30
M10
V30
T10
C20
C30
SD30
L10
G10
B10
G60
C10
C40
V40
G80
M40
G70
L20
SD40

FIG. 7

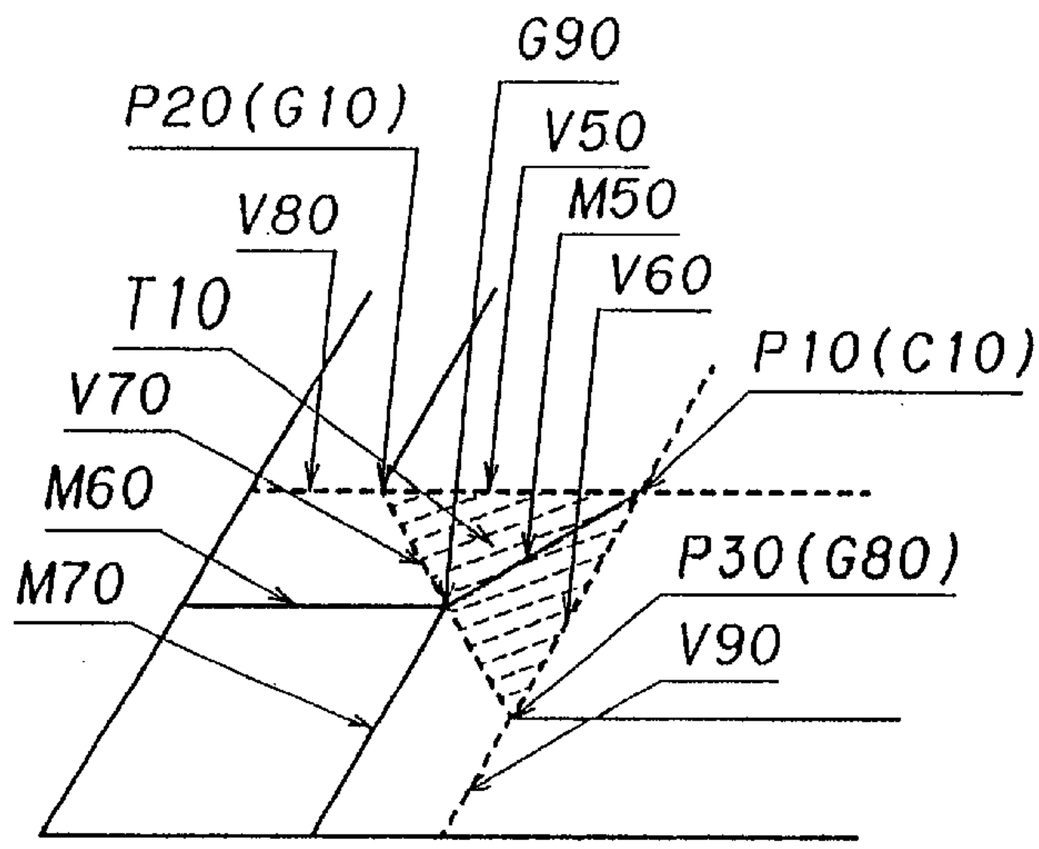

P20(G10)
G90
V80
V50
M50
T10
V60
P10(C10)
V70
M60
P30(G80)
M70
V90

FIG. 9

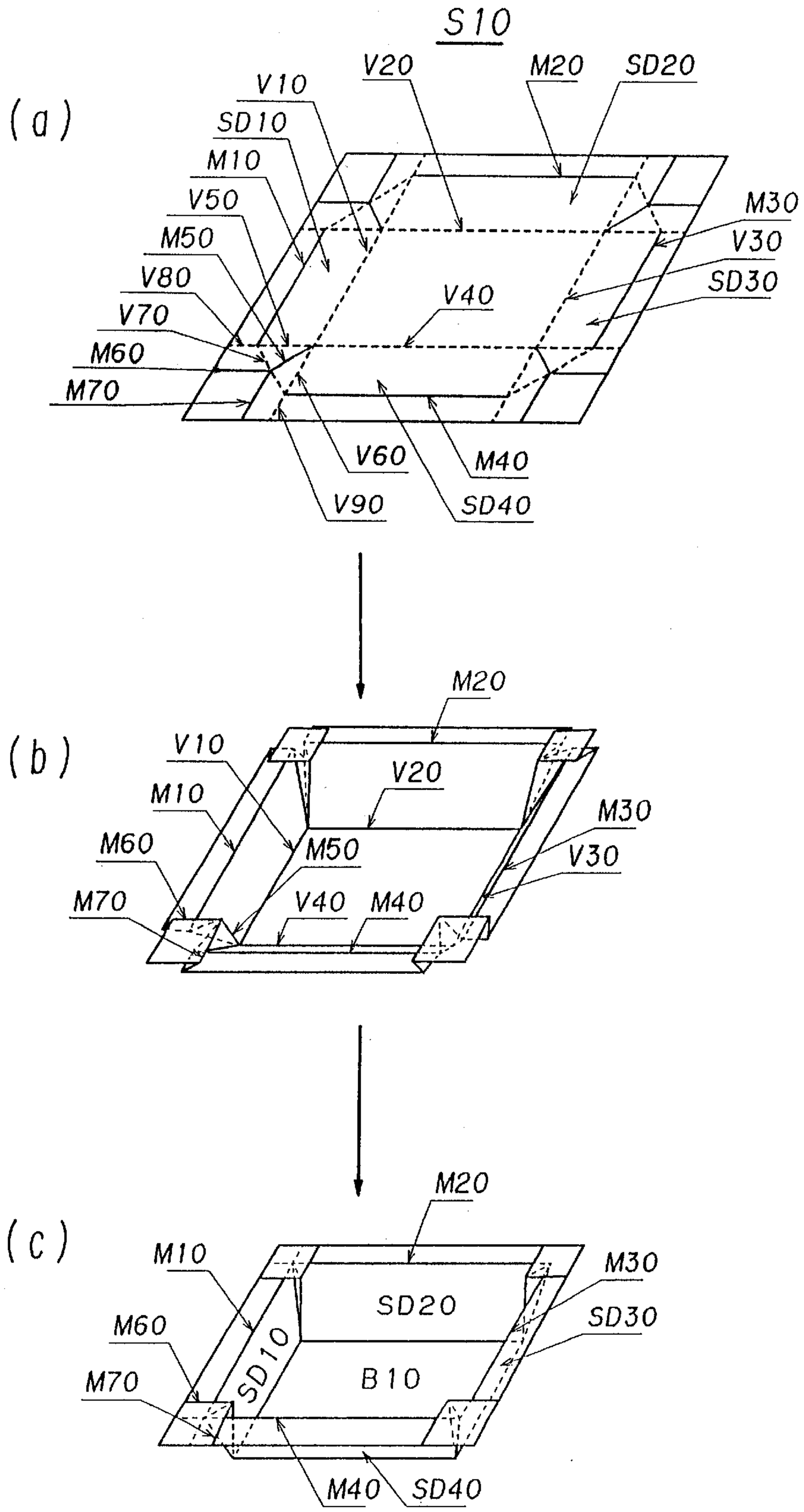

(a)
S10
V10
SD10
M10
V50
M50
V80
V70
M60
M70
V20
M20
SD20
M30
V30
SD30
V40
V60
V90
M40
SD40
(b)
M20
V10
M10
M60
M70
V20
M30
V30
M50
V40
M40
(c)
M20
M10
M60
M70
SD10
SD20
B10
M30
SD30
M40
SD40

FIG. 10

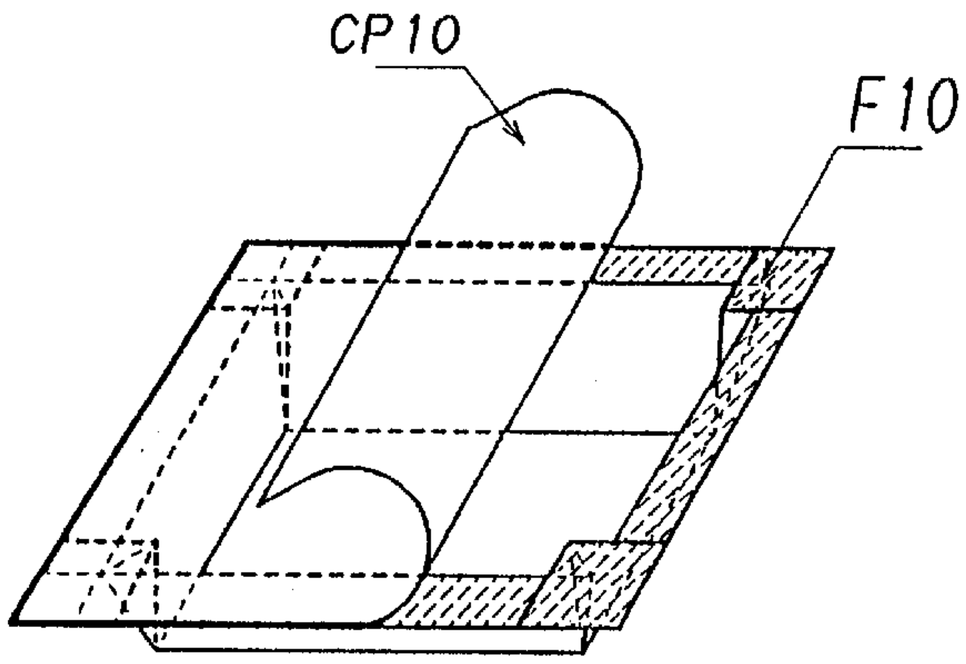


FIG. 12

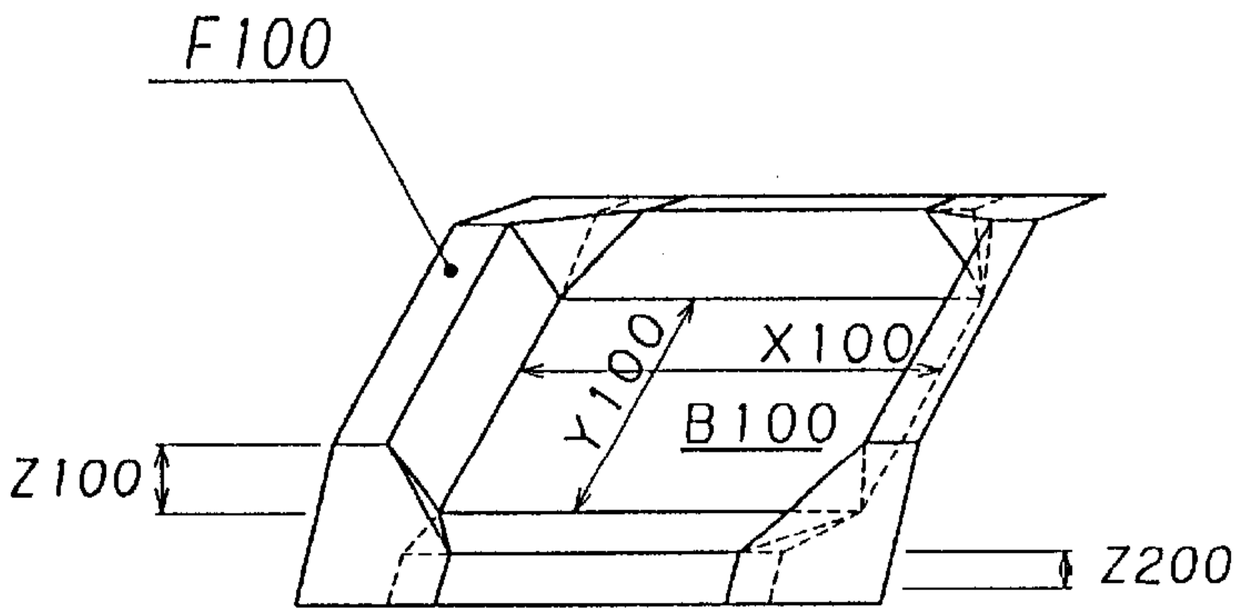


FIG. 14

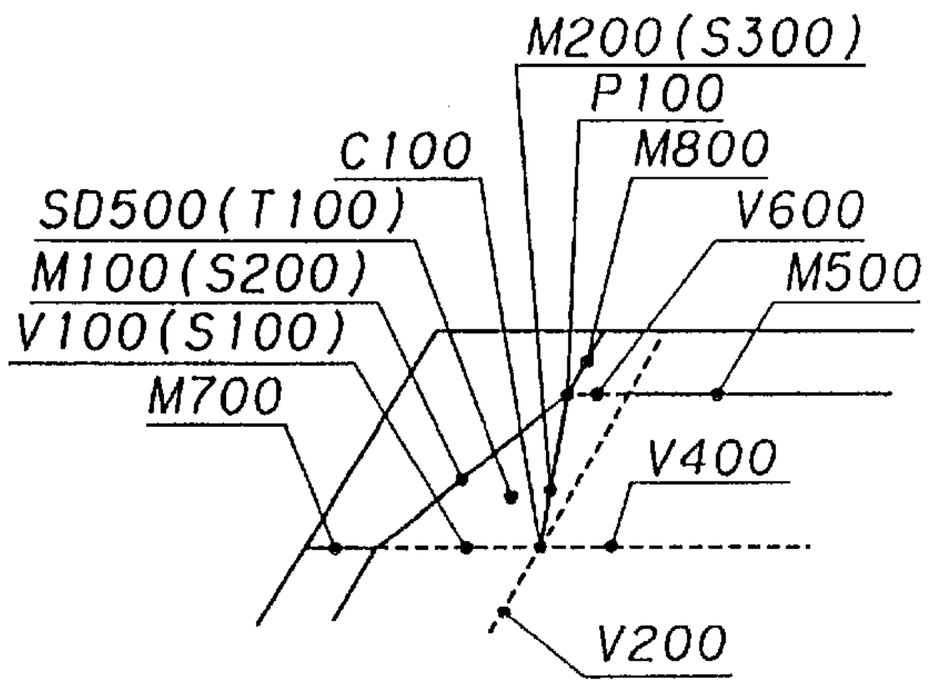


FIG. 11

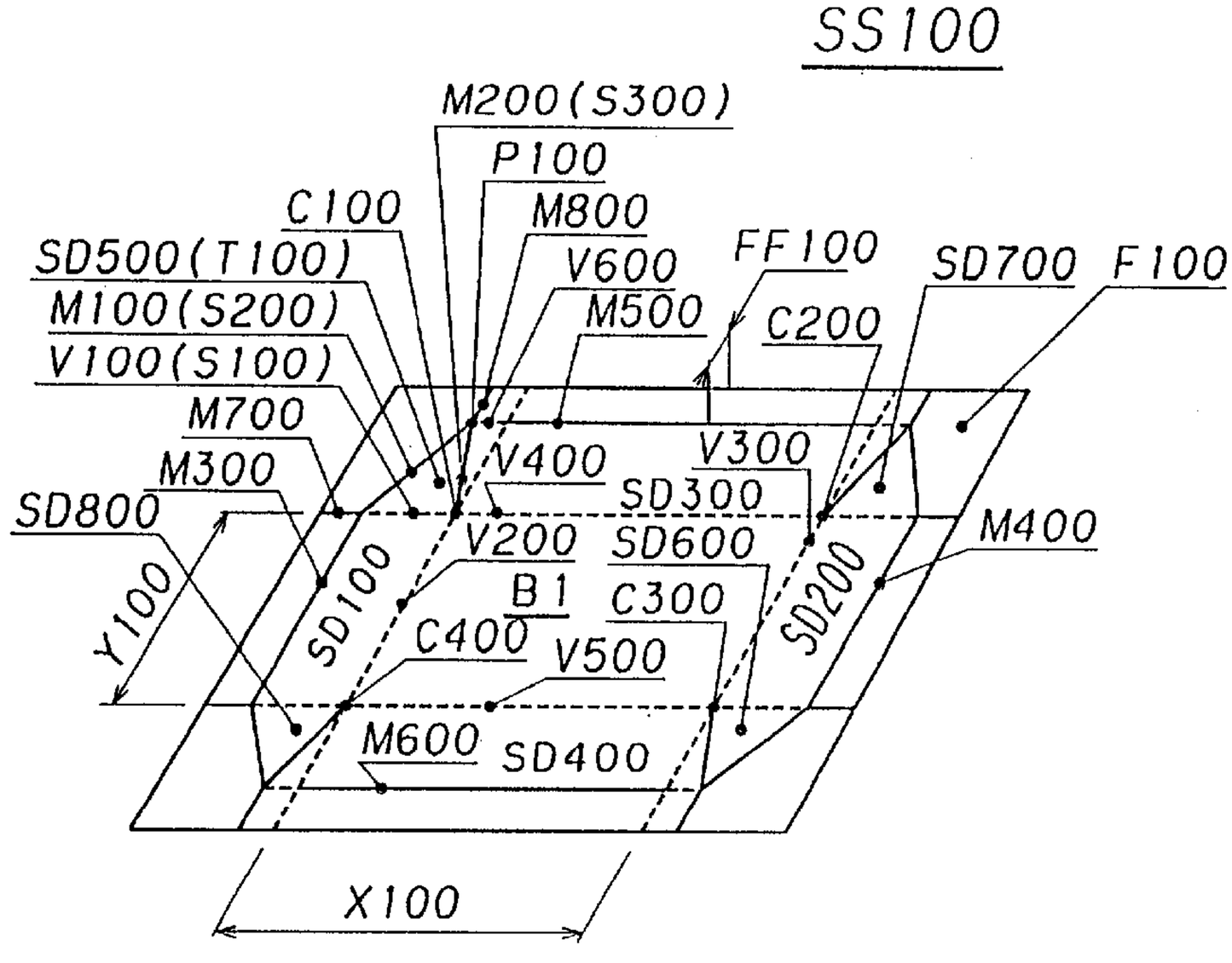
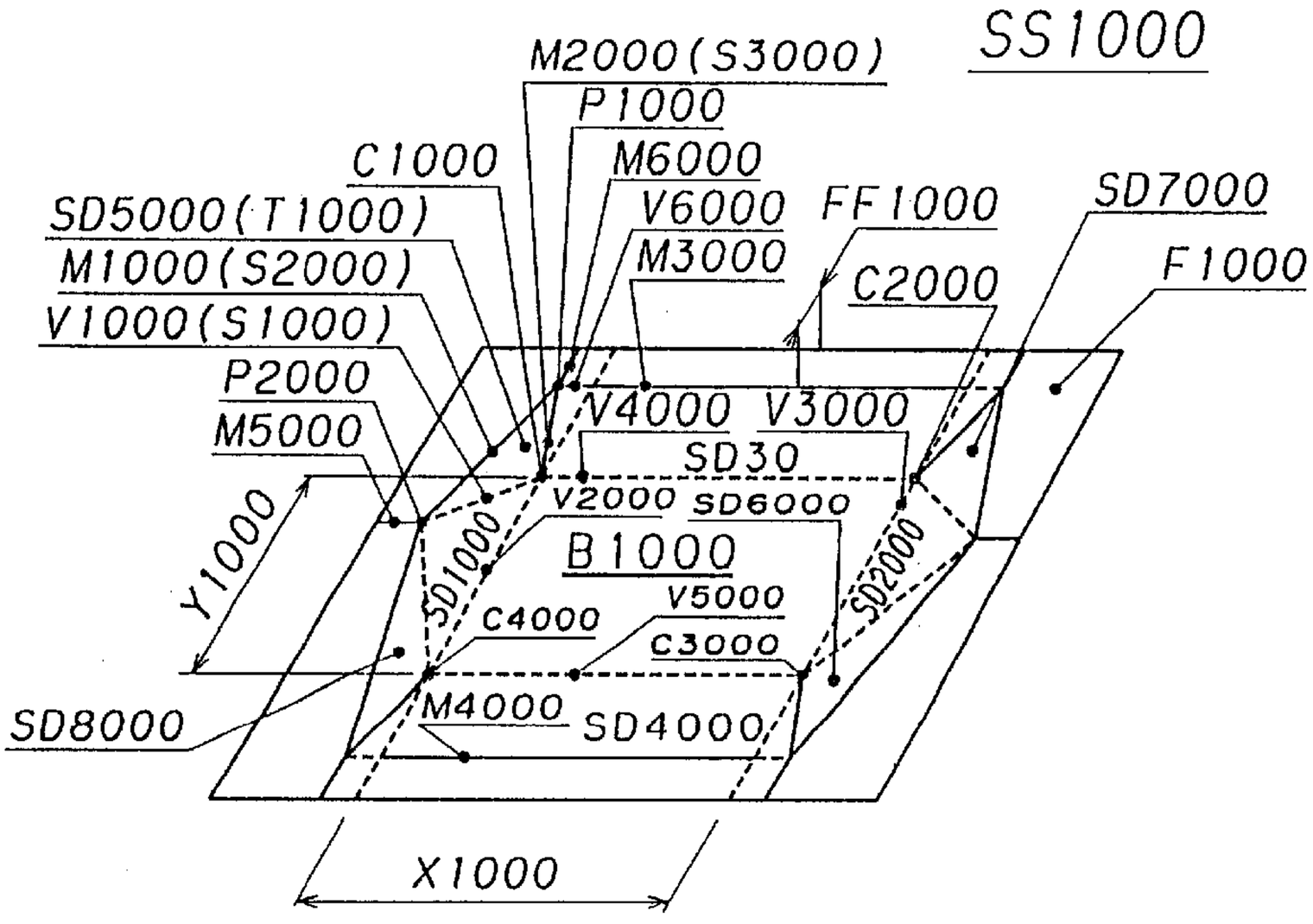

SS100
M200(S300)
P100
C100
M800
SD500(T100)
V600
FF100
SD700
F100
M100(S200)
M500
C200
V100(S100)
M700
V400
V300
M300
SD300
SD800
V200
SD600
M400
B1
C300
Y100
SD100
SD200
C400
V500
M600
SD400
X100

FIG. 23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M2000(S3000)
P1000
C1000
M6000
SD5000(T1000)
V6000
FF1000
SD7000
M1000(S2000)
M3000
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F1000
V1000(S1000)
P2000
V4000
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SD30
V2000
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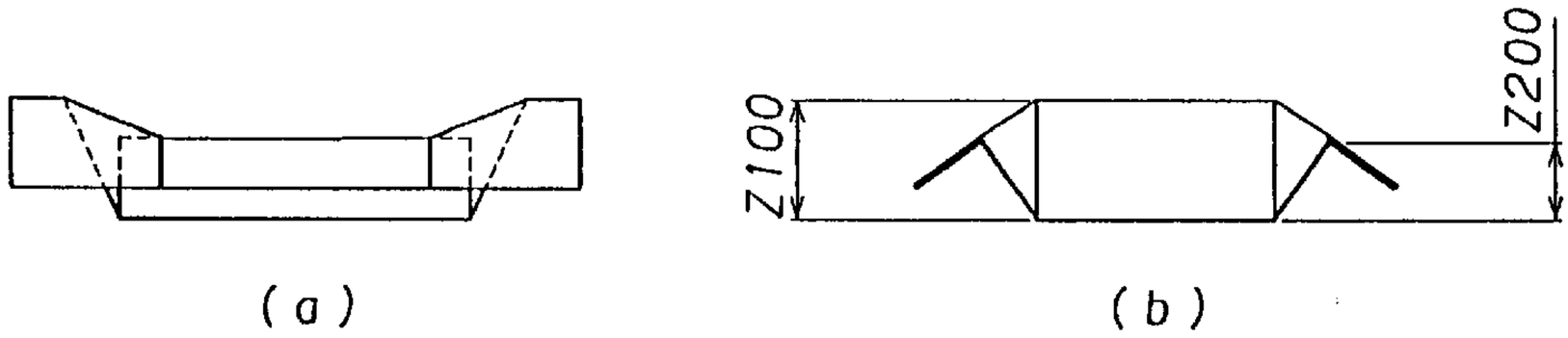
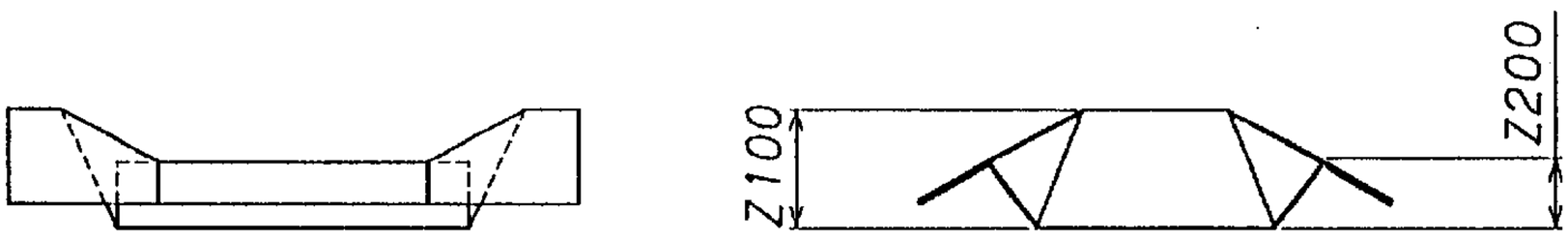
B1000
V5000
C4000
C3000
M4000
SD4000
SD8000
X1000

FIG. 13



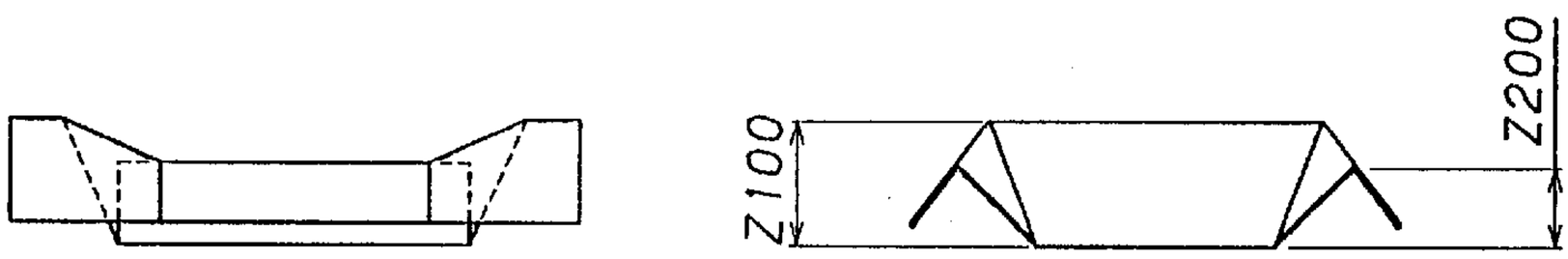
(a) (b)

FIG. 19



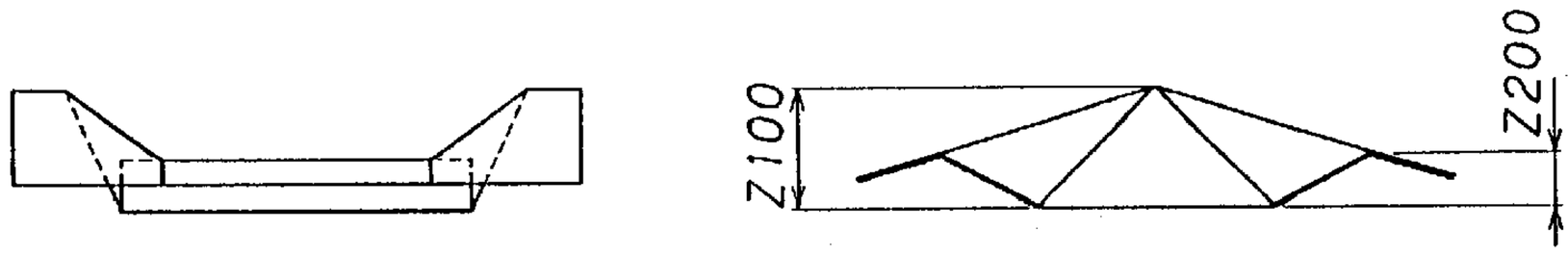
(a) (b)

FIG. 22



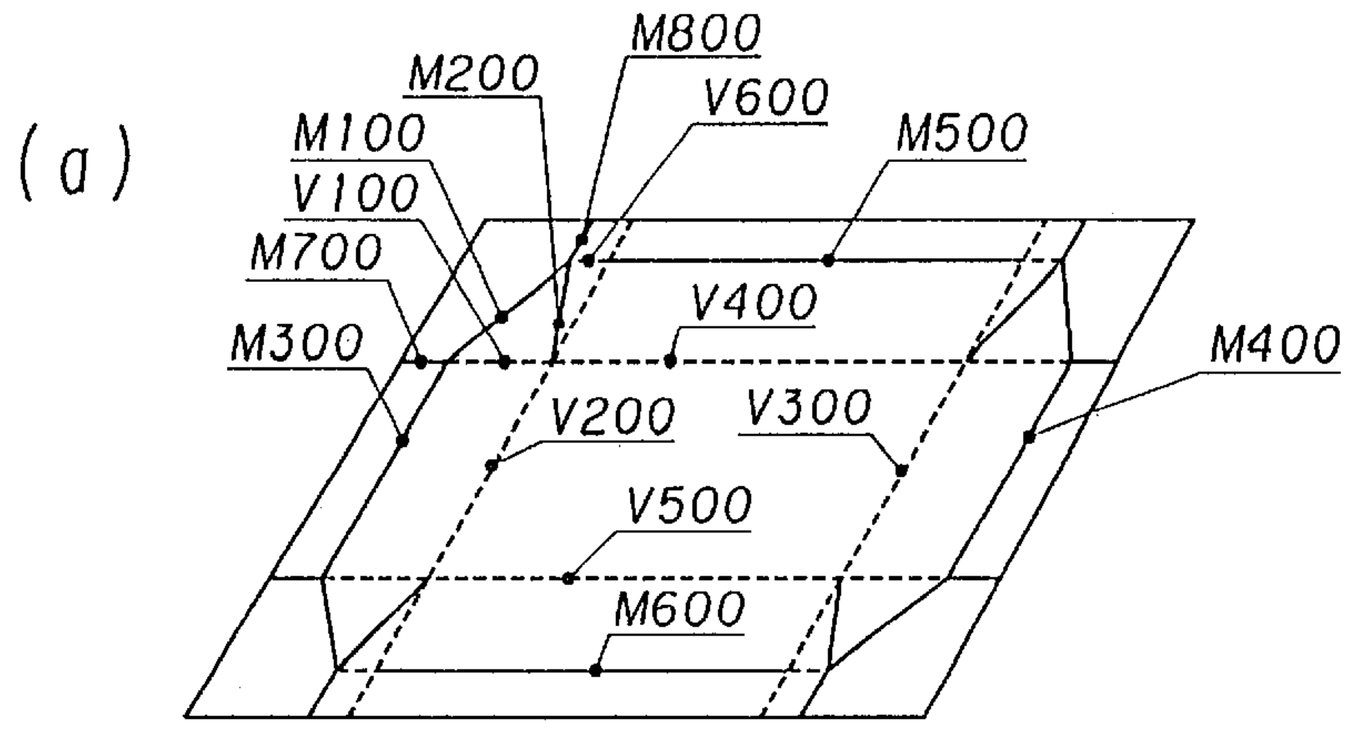
(a) (b)

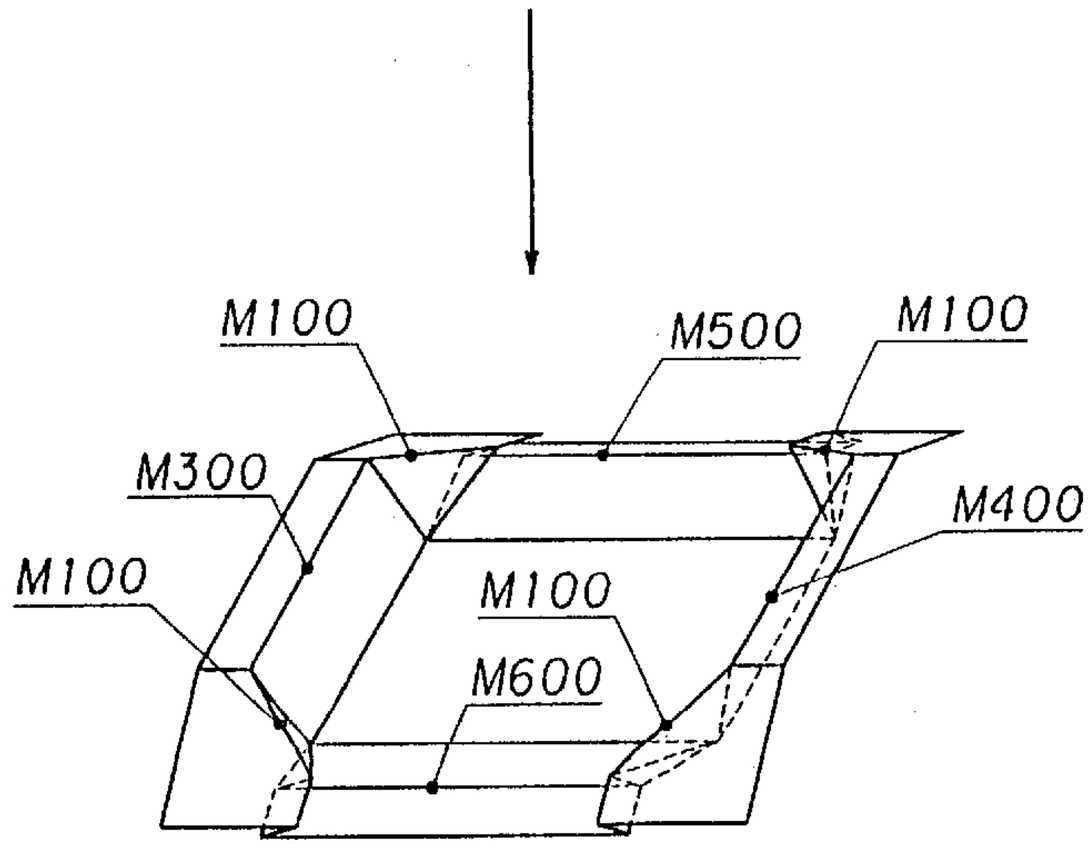
FIG. 25

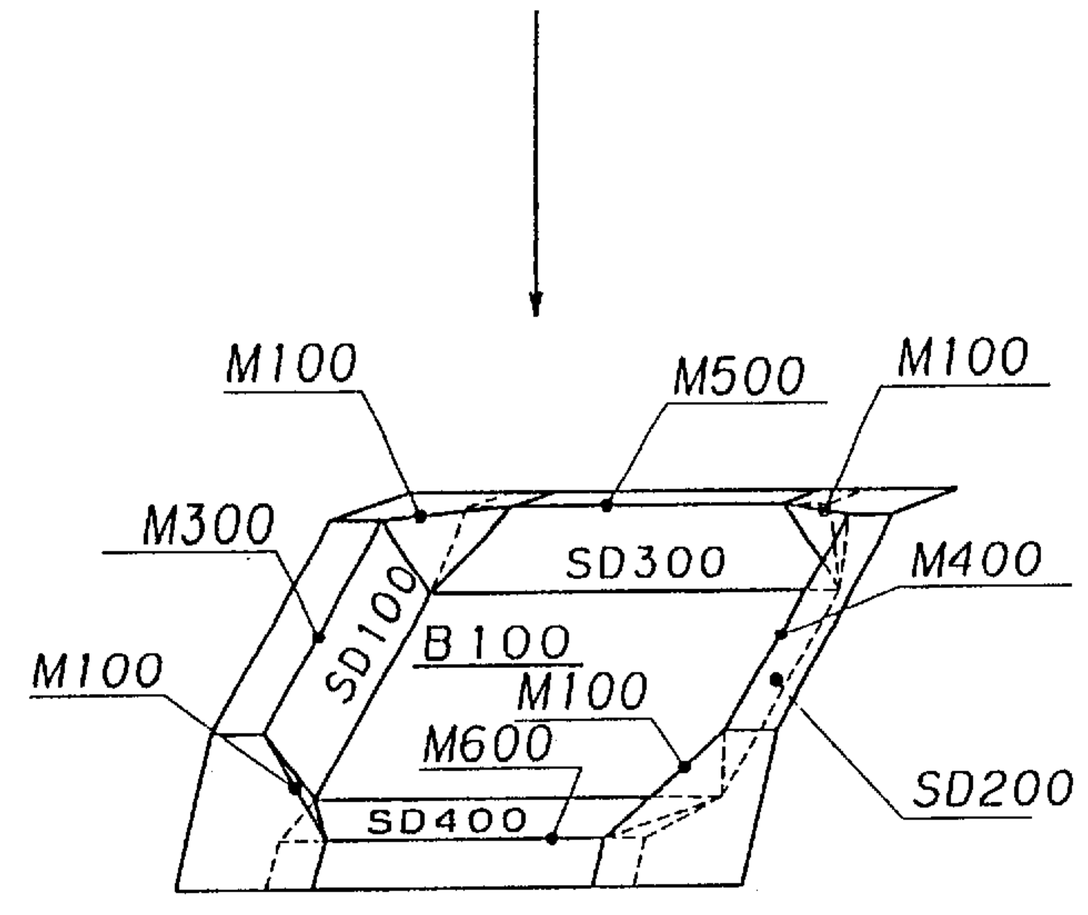


(a) (b)

FIG. 15


(a)
M800
M200
V600
M100
V100
M500
M700
V400
M300
M400
V200
V300
V500
M600


(b)
M100
M500
M100
M300
M400
M100
M100
M600


(c)
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M500
M100
M300
SD300
M400
SD100
B100
M100
M100
M600
SD200
SD400

FIG. 16

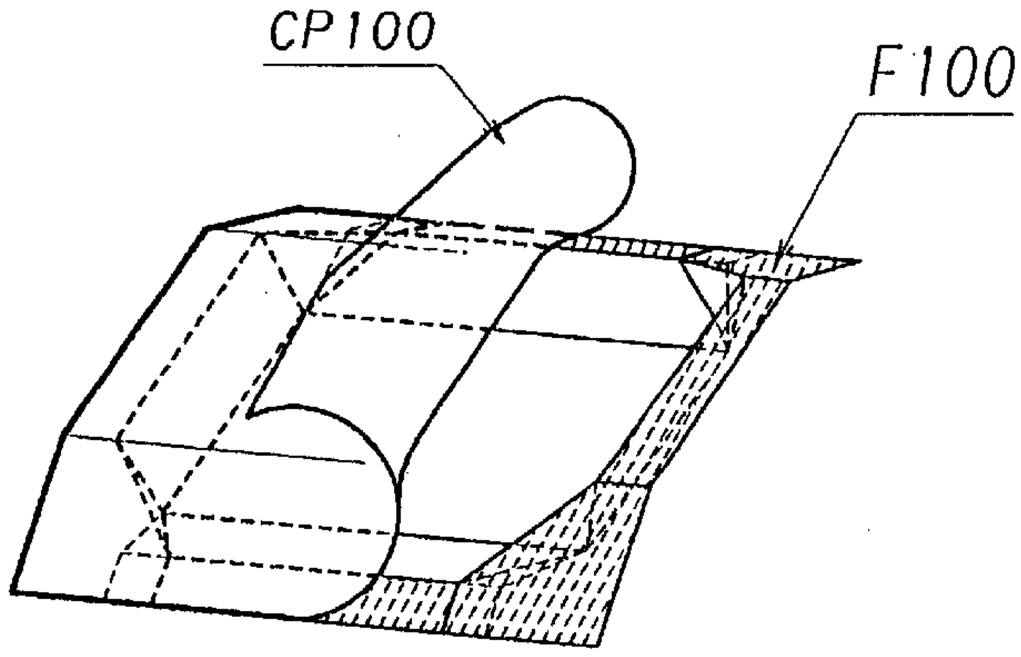


FIG. 18

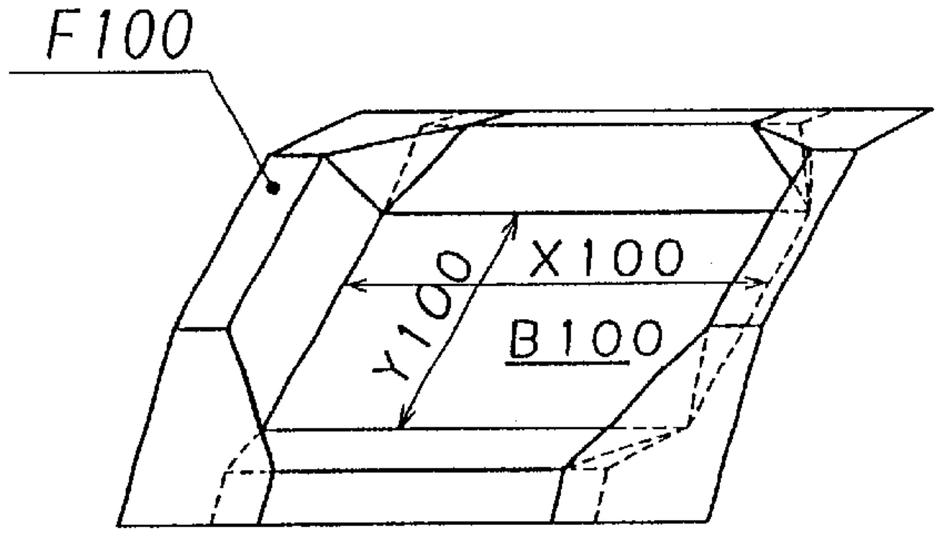


FIG. 21

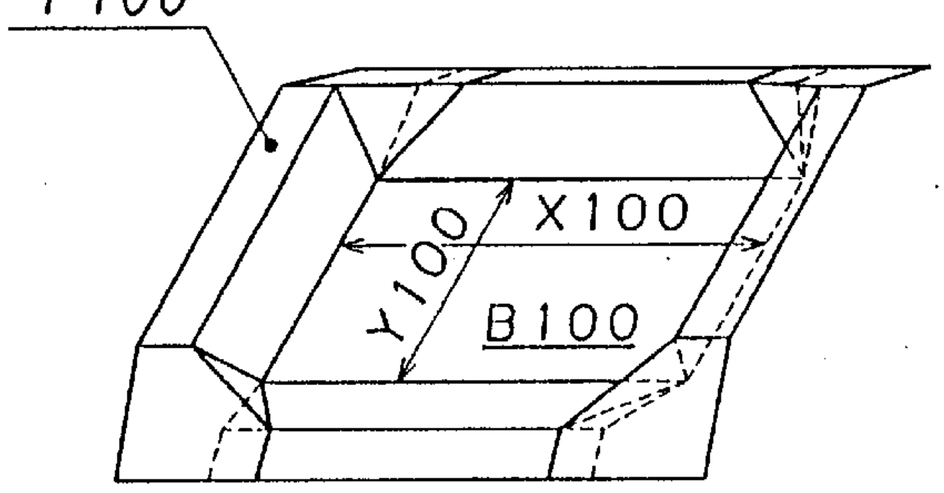
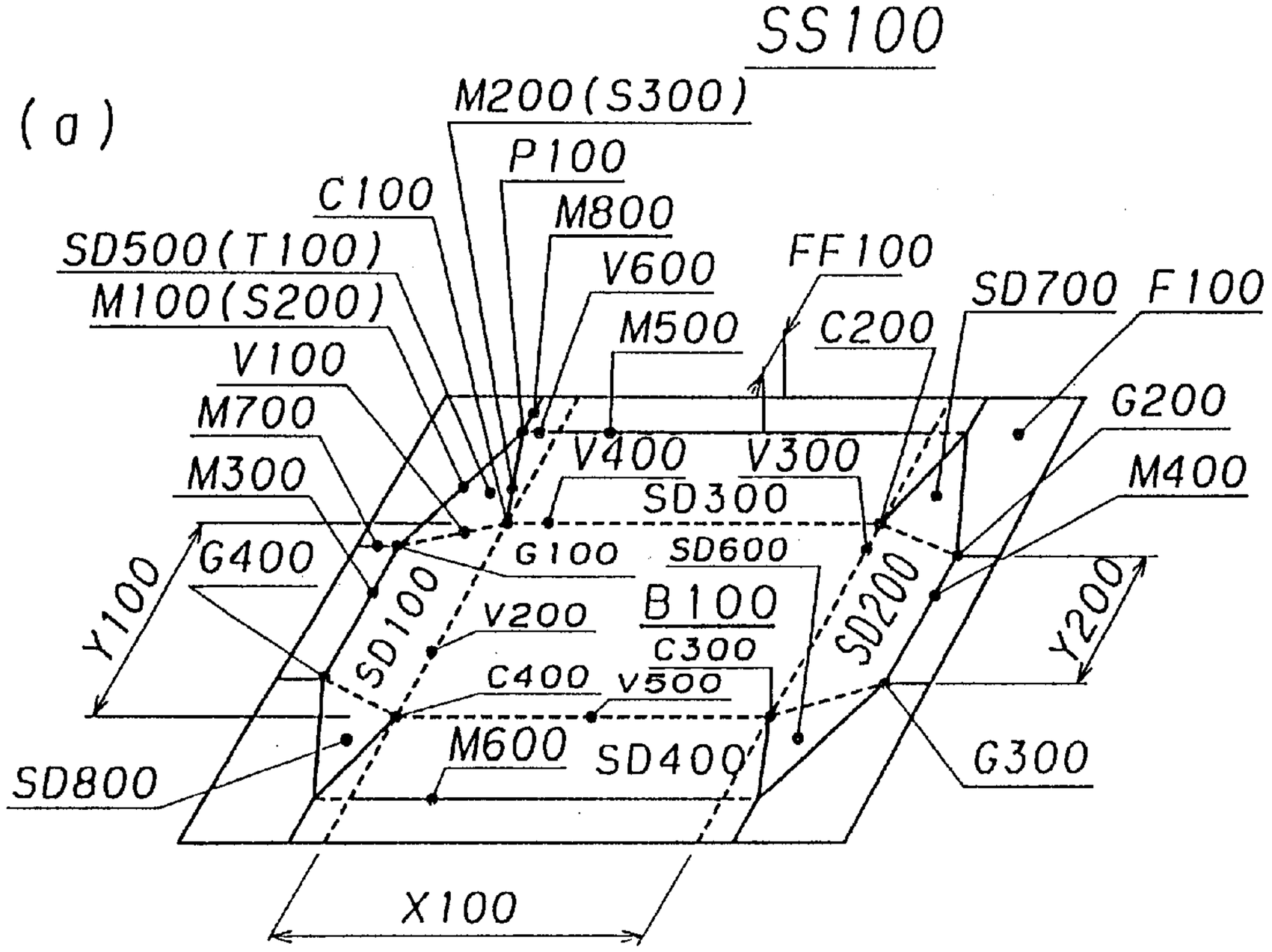


FIG. 17


(a)
SS100
M200(S300)
P100
C100
M800
SD500(T100)
V600
FF100
M100(S200)
M500
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SD700
F100
V100
G200
M700
V400
V300
M400
M300
SD300
G400
G100
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C400
V500
M600
SD400
SD800
G300
X100

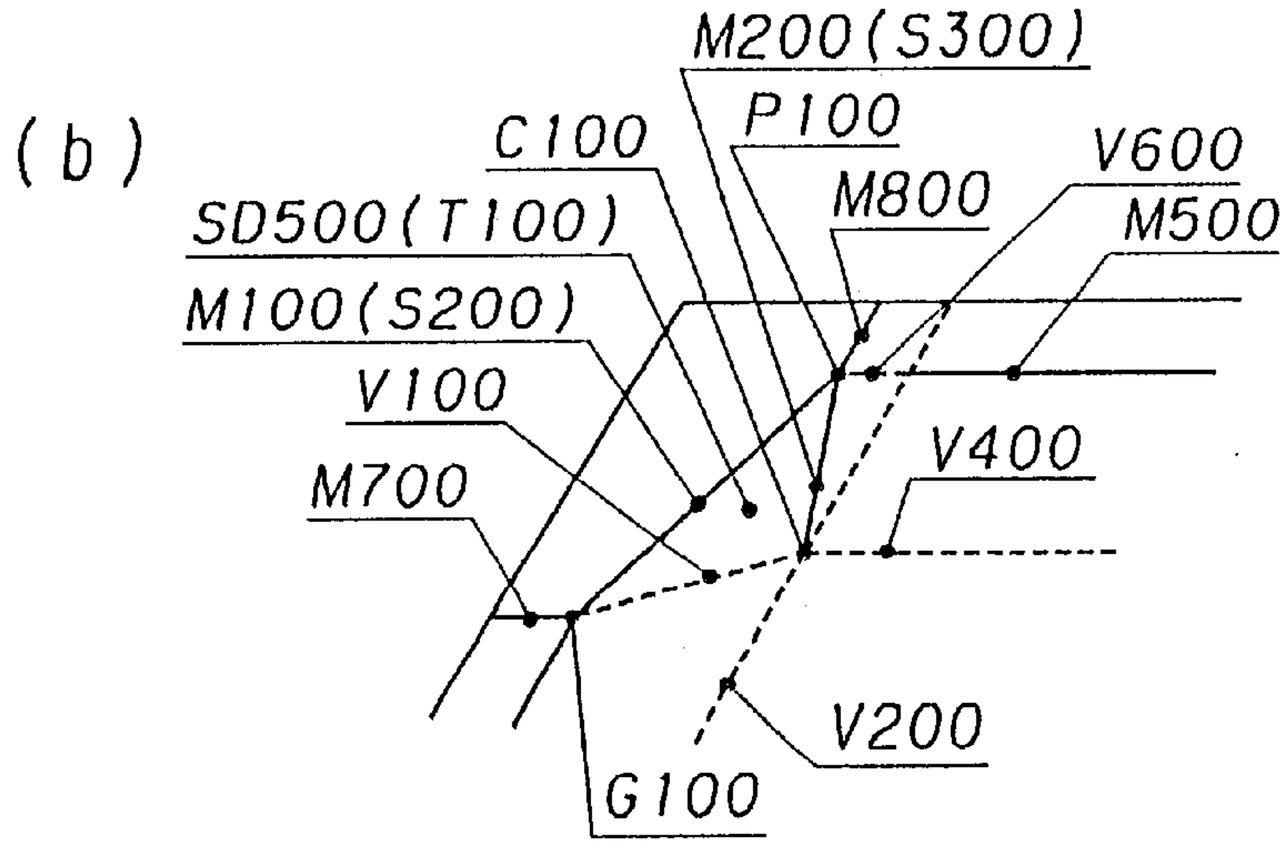
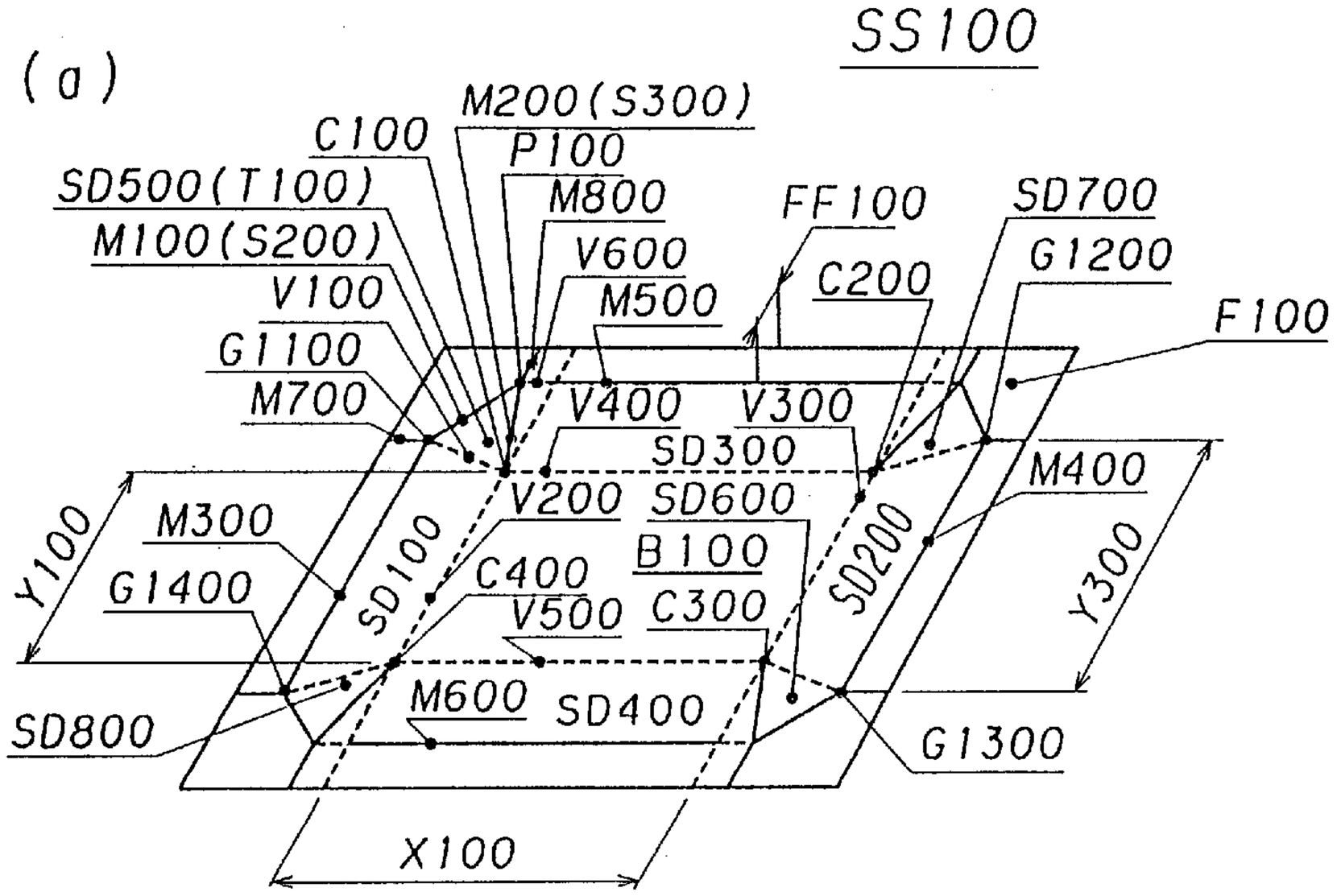

(b)
M200(S300)
C100
P100
V600
SD500(T100)
M800
M500
M100(S200)
V100
V400
M700
V200
G100

FIG. 20


(a)
SS100
M200(S300)
C100
P100
SD500(T100)
M800
FF100
SD700
M100(S200)
V600
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C200
M500
F100
G1100
M700
V400
V300
SD300
M400
V200
SD600
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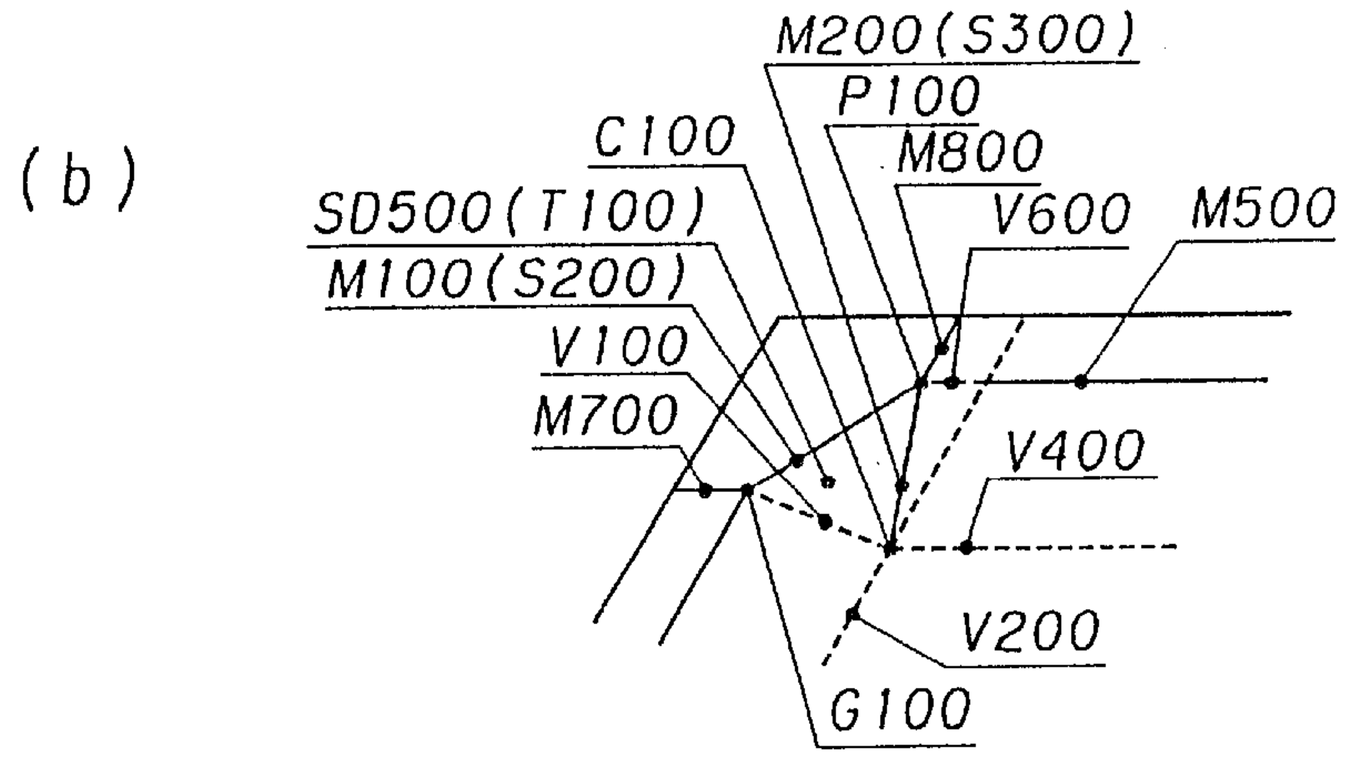
V500
C300
M600
SD400
SD800
G1300
X100


(b)
M200(S300)
P100
C100
M800
SD500(T100)
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M500
M100(S200)
V100
M700
V400
V200
G100

FIG. 24

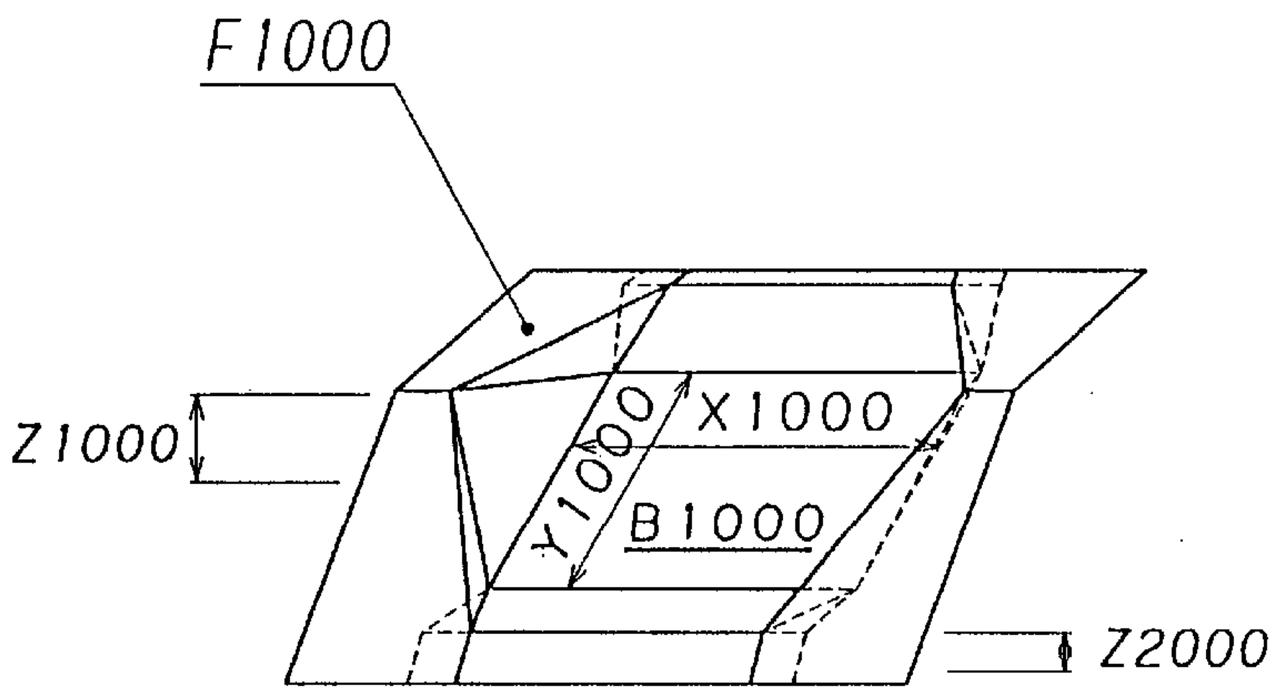


FIG. 26

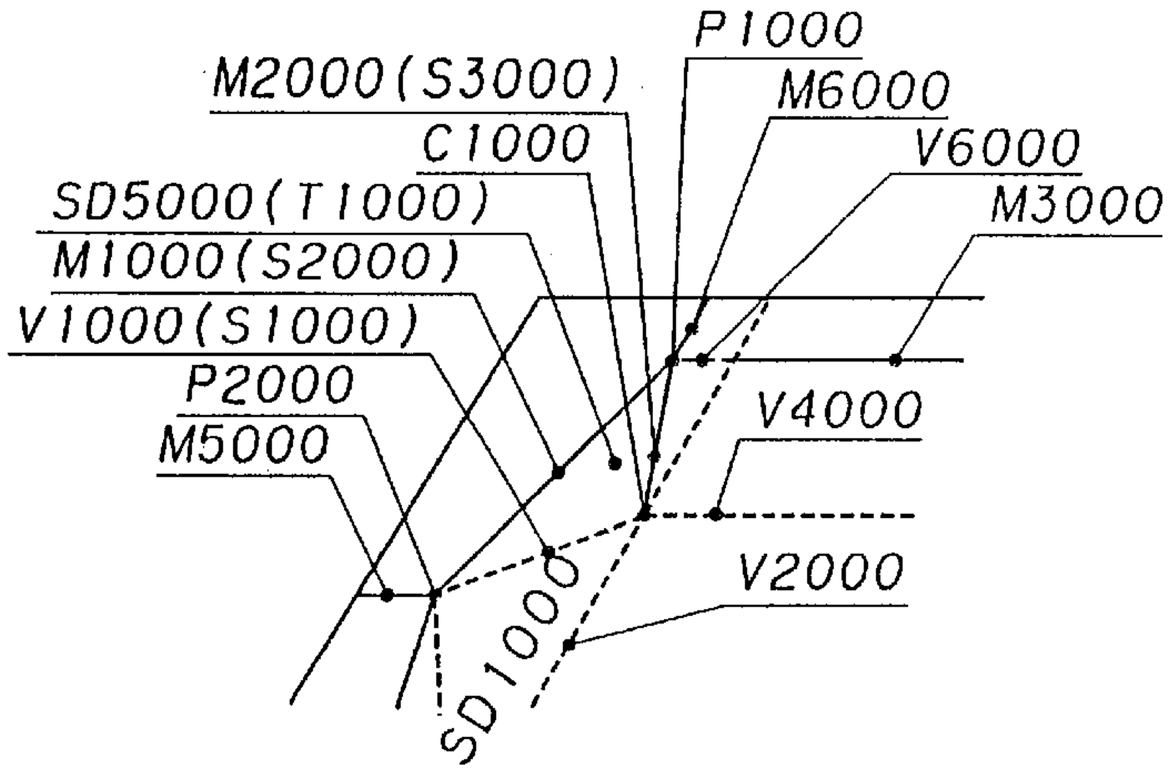


FIG. 28

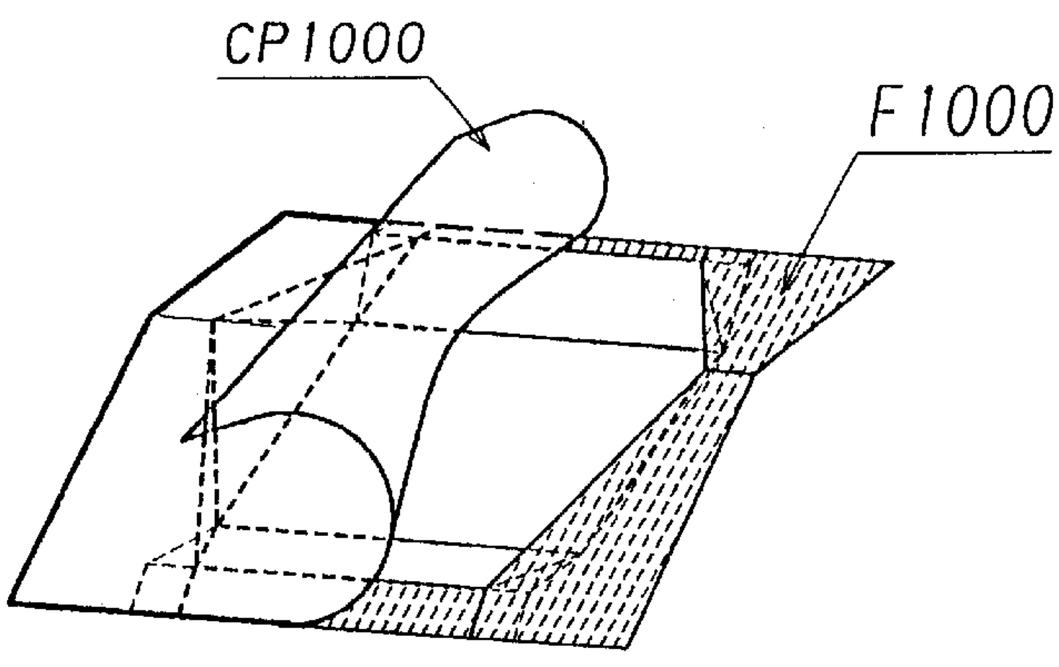
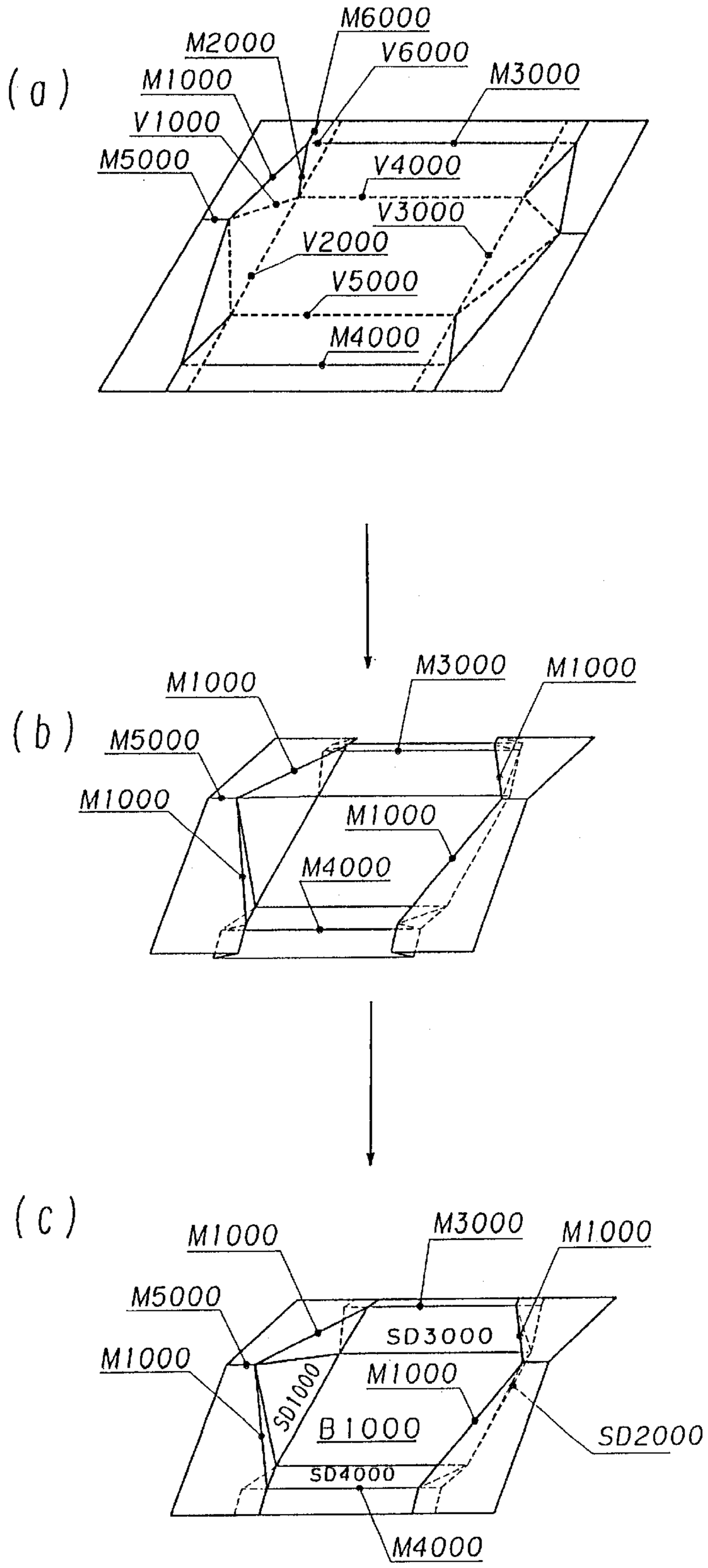


FIG. 27


(a)
M6000
M2000
V6000
M1000
M3000
V1000
M5000
V4000
V3000
V2000
V5000
M4000
(b)
M1000
M3000
M1000
M5000
M1000
M1000
M4000
(c)
M1000
M3000
M1000
M5000
SD3000
M1000
SD1000
M1000
B1000
SD2000
SD4000
M4000

PACKAGING CARTON

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a packaging carton, in particular to a packaging carton having a which has flange, on the upper face of which a sealing cover such as a transparent film can be bonded by fusion or adhesion with adhesives, so that it can be manufactured inexpensively and efficiently.

2. Description of the Related Art

Packaging cartons are traditionally manufactured by forming a sheet of film material, synthetic paper, or resin material with a forming tool. This manufacturing method requires an expensive forming tool which, when various kinds of packing cartons are manufactured, must be individually provided for each kind of the packing carton requiring much time and a large financial burden. In order to avoid this disadvantage, there is a method by which a packaging carton is provided by cutting a quadrilateral sheet from a strip sheet of film or paper conveyed in the longitudinal direction; providing the quadrilateral sheet with a first, second and third outward folding lines, a first, second and third inward folding lines, and angled inward folding lines; and folding the quadrilateral sheet to form a tray having a stepped flange around the periphery of the tray (JP-A-6-72425).

Moreover, there is a packaging technique in which a tray carton having a flange around the periphery thereof, is folded up from a carton blank cut in a specified shape (JP-A-60-240444 and U.S. Pat. No. 4,636,187, both being foreign applications of U.K. Patent 2158392).

However, the packaging cartons disclosed in the above patent documents have following drawbacks. In the former, the carton is formed with a flange being stepped without being formed to be flat making it difficult to bond a sealing cover, such as a transparent film, by fusion or adhesion with adhesives. In the latter, the periphery of the carton blank must be cut in a specified shape for the folded up tray to provide a flange around the periphery thereof, which may cause chips of the carton blank to enter inside the tray carton. This makes the tray carton unsuitable as a packaging carton for packing foods.

The present invention was made in order to eliminate the above drawbacks with an object of providing a packaging carton which has a flat formed flange on the upper face of which a sealing cover such as a transparent film can be bonded, and can be inexpensively manufactured with high efficiency.

SUMMARY OF THE INVENTION

In order to achieve such object, a packaging carton according to the first aspect of the present invention is made by folding a quadrilateral sheet in a polyhedron with the specified length, width and height with a flat flange provided around a periphery thereof.

The quadrilateral sheet comprises: four inward folding lines each being formed to pass two of four corner points of a bottom plane of the polyhedron having the specified length and width; and four outward folding lines each being formed to be in parallel with each of the four inward folding lines with a distance therefrom equal to the specified height, and to have a length equal to a distance between the two of the four corner points on the inward folding line in parallel therewith.

In a region formed at each of four corners of the quadrilateral sheet between two of the four side planes formed between the four inward folding lines and the four outward folding lines, respectively, the region comprises: three outward folding lines forming a triangle extending from a vertex at one of the corner points; two outward folding lines each being formed to extend from each of the other two vertices of the triangle in parallel with one of the four outward folding lines forming the side plane beyond the rest of the other two vertices; and two inward folding lines each being formed to extend from an end of one of the four outward folding lines forming one of the side planes to one of the other two vertices near the end.

A packaging carton according to the second aspect of the present invention is made by folding a quadrilateral sheet in a polyhedron with the specified length, width and height with a flat flange provided around a periphery thereof.

The quadrilateral sheet comprises: four inward folding lines each being formed to connect two of four corner points of a bottom plane of the polyhedron having the specified length and width; and four outward folding lines each being formed to be in parallel with each of the four inward folding lines with a distance therefrom equal to the specified height.

In a region formed at each of four corners of the quadrilateral sheet including each of the four corner points, the region comprises: two inward folding lines which extend from one of the corner points to the ends of the two of the four outward folding lines near the corner point, respectively; one inward folding line which connects the ends of two of the four outward folding lines near the corner point; one outward folding line dropped from the corner point as a vertex of a triangle, formed with the two inward folding lines and the one inward folding line, to the one inward folding line as a base so as to divide the triangle into two; two inward folding lines each extending from each of the other two vertices of the triangle in parallel with one of the four outward folding lines extended to the end as the rest of the other two vertices; and two outward folding lines each extending from an end of the one outward folding line on the one inward folding line as the base in parallel with one of the four outward folding lines extended to the one of the other two vertices beyond the other of the two outward folding lines.

According to the forms of the packaging cartons in the first and second aspects, a quadrilateral sheet is cut out from a strip sheet of film or paper conveyed in the longitudinal direction. From the quadrilateral sheet, a packaging carton, having a flattened flange on the upper face of which a sealing cover such as a transparent film can be bonded, can be inexpensively manufactured with high efficiency.

Moreover, a packaging carton according to the third aspect of the present invention is made by folding a quadrilateral sheet in a polyhedron formed to have a bottom plane with specified length and width, a pair of facing long side planes each with a specified long height, a pair of facing short side planes each with a specified short height, two pairs of facing inclined side planes each being in the form of a triangle formed between the long side plane and the short side plane with one side connected to the long side plane, one of the other two sides connected to the short side plane and one vertex between the above sides being at each of four corner points of the bottom plane, and a flange formed with a continuous face and provided around a periphery.

The quadrilateral sheet comprises: two first inward folding lines, each formed to pass two of four corner points of a bottom plane of the polyhedron having the specified length

and width, and to have a length equal to a sum of the specified width, twice the specified short height, and twice the width of the flange; two second inward folding lines, each formed to cross the two first inward folding lines at right angles to connect two of the four corner points, and to have a length equal to the specified length; two outward folding lines each being formed to have a length equal to the specified length between two of the four corner points and to be in parallel with one of the second inward folding lines with a distance therefrom equal to the specified short height; two pairs of inward folding lines each line extending from each end of the second inward folding line at one of the four corner points, and forming the one side of the triangle connected to the one of the long side planes; two pairs of outward folding lines each pair extending from both ends of each pair of the inward folding lines in parallel with the second inward line; and two outward folding lines each being formed to have a length equal to a distance between the two pairs of the outward folding lines and to be in parallel with one of the first inward folding lines with a distance therefrom equal to the specified long height.

In a region formed at each of four corners of the quadrilateral sheet between the long side plane and short side plane, the region comprises: an inward folding line which extends from one of the two outward folding lines having the length equal to the specified length, and being in parallel with the second inward folding line; two outward folding lines, forming the other two sides of the triangle, drawn from a point as one of the other vertices at an end of the inward folding line; and an outward folding line formed to extend from the point as the one of the other vertices of the triangle in parallel with the first inward folding line.

In the package carton according to the third aspect of the present invention, each pair of the two pairs of outward folding lines which extend from both ends of each pair of the two pairs of the inward folding lines are formed at a distance equal to the specified width from the other pair of outward folding lines.

Also in the package carton according to the third aspect of the present invention, each pair of the two pairs of outward folding lines which extend from both ends of each pair of the two pairs of the inward folding lines are formed at a distance smaller than the specified width from the other pair of outward folding lines.

Furthermore, in the package carton according to the third aspect of the present invention, each pair of the two pairs of outward folding lines which extend from both ends of each pair of the two pairs of the inward folding lines are formed at a distance larger than the specified width from the other pair of outward folding lines.

In addition, a packaging carton according to the fourth aspect of the present invention is made by folding a quadrilateral sheet in a polyhedron having a bottom plane with specified length and width, a pair of facing triangular long side planes each with a specified long height, a pair of facing quadrilateral short side planes each with a specified short height, two pairs of facing inclined side planes each being in a form of a triangle formed between the long side plane and the short side plane with one side connected to the long side plane, one of the other two sides connected to the short side plane and one of vertices between the above sides being at one of four corner points of the bottom plane, and a flange formed with a continuous face and provided around a periphery.

The quadrilateral sheet comprises: two first inward folding lines each being formed to pass two of the four corner points of a bottom plane of the polyhedron having the specified length and width, and to have a length equal to a sum of the specified width, twice the specified short height, and twice the width of the flange; two second inward folding lines each crossing the two first inward folding lines at right angles, and with a length equal to the specified length; two outward folding lines each being formed to have a length equal to the length of the second inward folding line and to be in parallel therewith with a distance therefrom equal to the specified short height; and two outward folding line each extending in parallel with the second inward folding line from a vertex of each of the pair of the triangles of the long side planes.

In a region formed at each of four corners of the quadrilateral sheet between the long side plane and short side plane, the region comprises: an inward folding line forming the one side of the triangle connected to the one of the long side planes; two outward folding lines, forming the other two sides of the triangle, drawn from a point as one of the other vertices at a distance from an imaginary extension of the second inward folding line being equal to the short height of the short side plane; an inward folding line formed to extend in parallel with the second inward line to the point as one of the other vertices from an end of one of the two outward folding lines; and an outward folding line formed to extend from the point as the one of the other vertices of the triangle in parallel with the first inward folding line.

According to the forms of the packaging cartons in the third and fourth aspects, a quadrilateral sheet is cut out from a strip sheet of film or paper conveyed in the longitudinal direction. From the quadrilateral sheet, a packaging carton, having a flange with flattened bent portions, on the upper face of which a sealing cover such as a transparent film can be bonded, can be inexpensively manufactured with high efficiency. Moreover, in the packaging carton in the third aspect in which the flange, positioned at the top of the carton, can be made in parallel with the bottom face, it is possible to vary the length of the flange formed in parallel with the bottom face.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view showing a quadrilateral sheet provided with inward folding lines and outward folding lines for forming a packaging carton in a first embodiment according to the present invention;

FIG. **2** is a partial perspective view showing a region at a corner of the quadrilateral sheet provided with inward folding lines and outward folding lines for forming the packaging carton in the first embodiment according to the present invention;

FIG. **3** is a perspective view showing the packaging carton in the first embodiment according to the present invention;

FIGS. **4**A to **4**C are perspective views showing the steps of forming the packaging carton in the first embodiment according to the present invention;

FIG. **5** is a perspective view showing the step of sealing the packaging carton in the first embodiment according to the present invention;

FIG. **6** is a perspective view showing a quadrilateral sheet provided with inward folding lines and outward folding lines for forming a packaging carton in a second embodiment according to the present invention;

FIG. **7** is a partial perspective view showing a region at a corner of the quadrilateral sheet provided with inward folding lines and outward folding lines for forming the

packaging carton in the second embodiment according to the present invention;

FIG. **8** is a perspective view showing the packaging carton in the second embodiment according to the present invention;

FIGS. **9**A to **9**C are perspective views showing the steps of forming the packaging carton in the second embodiment according to the present invention;

FIG. **10** is a perspective view showing the step of sealing the packaging carton in the second embodiment according to the present invention;

FIG. **11** is a perspective view showing a quadrilateral sheet provided with inward folding lines and outward folding lines for forming a packaging carton in a third embodiment according to the present invention;

FIG. **12** is a perspective view showing the packaging carton in the third embodiment according to the present invention;

FIG. **13**A is a front view showing the package carton in the third embodiment according to the present invention;

FIG. **13**B is a side view showing the package carton in the third embodiment according to the present invention;

FIG. **14** is a partial perspective view showing a region at a corner of the quadrilateral sheet provided with inward folding lines and outward folding lines for forming the packaging carton in the third embodiment according to the present invention;

FIGS. **15**A to **15**C are perspective views showing the steps of forming the packaging carton in the third embodiment according to the present invention;

FIG. **16** is a perspective view showing the step of sealing the packaging carton in the third embodiment according to the present invention;

FIG. **17**A is a perspective view showing a quadrilateral sheet provided with inward folding lines and outward folding lines for forming a packaging carton in a modification of the third embodiment according to the present invention;

FIG. **17**B is a partial perspective view showing a region at a corner of the quadrilateral sheet shown in FIG. **17**A;

FIG. **18** is a perspective view showing the packaging carton completed by folding the quadrilateral sheet shown in FIGS. **17**A and **17**B;

FIG. **19**A is a front view showing the package carton shown in FIG. **18**;

FIG. **19**B is a side view showing the package carton shown in FIG. **18**;

FIG. **20**A is a perspective view showing a quadrilateral sheet provided with inward folding lines and outward folding lines for forming a packaging carton in another modification of the third embodiment according to the present invention;

FIG. **20**B is a partial perspective view showing a region at a corner of the quadrilateral sheet shown in FIG. **20**A;

FIG. **21** is a perspective view showing the packaging carton completed by folding the quadrilateral sheet shown in FIGS. **20**A and **20**B;

FIG. **22**A is a front view showing the package carton shown in FIG. **21**;

FIG. **22**B is a side view showing the package carton shown in FIG. **21**;

FIG. **23** is a perspective view showing a quadrilateral sheet provided with inward folding lines and outward folding lines for forming a packaging carton in a fourth embodiment according to the present invention;

FIG. **24** is a perspective view showing the packaging carton in the fourth embodiment according to the present invention;

FIG. **25**A is a front view showing the package carton in the fourth embodiment according to the present invention;

FIG. **25**B is a side view showing the package carton in the fourth embodiment according to the present invention;

FIG. **26** is a partial perspective view showing a region at a corner of the quadrilateral sheet provided with inward folding lines and outward folding lines for forming the packaging carton in the fourth embodiment according to the present invention;

FIGS. **27**A to **27**C are perspective views showing the steps of forming the packaging carton in the fourth embodiment according to the present invention;

FIG. **28** is a perspective view showing the step of sealing the packaging carton in the fourth embodiment according to the present invention;

DETAILED DESCRIPTION OF THE INVENTION

Preferred embodiments of the packaging cartons according to the present invention will be explained in detail in the following with reference to the drawings.

First Embodiment

In the embodiment, a packaging carton according to the present invention is that made by folding a quadrilateral sheet **S1** (FIG. **1**) in a polyhedron having specified length **X1**, width **Y1** and height **Z1** with a flat flange **F1** (FIG. **3**) provided around a periphery thereof.

In order to make the package carton, the quadrilateral sheet SI comprises four inward folding lines **V1** to **V4**, each being formed to pass two of four corner points **C1** to **C4** (FIG. **1**) of a bottom plane **B1** of the polyhedron having the specified length **X1** and width **Y1**, and four outward folding lines **M1** to **M4** each being formed to be in parallel with each of the four inward folding lines **V1** to **V4** with a distance therefrom equal to the specified height **Z1**, and to have a length equal to a distance between the two of the four corner points **L1** or **L2** on the inward folding line in parallel therewith.

In a region formed at each of four corners of the quadrilateral sheet between two of four side planes **SD1** to **SD4** formed between the four inward folding lines **V1** to **V4** and the four outward folding lines **M1** to **M4**, respectively, the region comprises three outward folding lines **M5** to **M7** forming a triangle **T1** extending from a vertex **P1** (FIG. **2**) at one of the corner points **C1** to **C4**; two outward folding lines **M8** and **M9** each being formed to extend from each of the other two vertices **P2** and **P3** of the triangle **T1** in parallel with one of the four outward folding lines **M1** to **M4** forming the side plane beyond the rest of the other two vertices; and two inward folding lines **V5** and **V6** each being formed to extend from an end **G1** to **G8** of one of the four outward folding lines forming one of the side planes to one of the other two vertices near the end. In FIG. **1** and FIG. **2**, the inward folding lines and the outward folding lines are represented by broken lines and solid lines, respectively.

The quadrilateral sheet **S1** (FIG. **4**A) comprising the above inward folding lines and outward folding lines shown in FIG. **1** and FIG. **2** is folded as described below.

The four inward folding lines **V1** to **V4** are folded inward and the four outward folding lines **M1** to **M4** are folded outward, and in each of regions at the four corners of the

quadrilateral sheet S1, the two inward folding lines V5 and V6 are folded inward and the three outward folding lines M5 to M7 forming the triangle T1, the two outward folding lines M8 and M9 are folded outward, by which a package carton is obtained in a form before being completed (FIG. 4B). The above inward and outward folding is further carried out completely for the completion of the package carton (FIG. 3 and FIG. 4C), which is formed with the four side planes SD1 to SD4 each connected by the triangle T1 on the bottom plane B1 of the polyhedron, four outward folding lines M1 to M4 each connected by the outward folding line M5 and a flat flange F1 extending from the outward folding lines M1 to M4 and M5 in the horizontal direction on all sides of the periphery.

Into the packaging carton thus formed, contents (not shown in the drawings) are put to be held with a sealing cover CP 1 (FIG. 5) applied over the contents and mounted on the flange F1 to be bonded thereto by, for example, fusing. This constitutes a sealed packaging carton in which contents such as food or drink are held.

Second Embodiment

In the embodiment, a packaging carton according to the present invention is that made by folding a quadrilateral sheet S10 (FIG. 6) in a polyhedron having specified length X10, width Y10 and height Z10 with a flat flange F10 (FIG. 8) provided around a periphery thereof.

In order to make the package carton, the quadrilateral sheet S10 comprises: four inward folding lines V10 to V40 each being formed to connect two of four corner points C10 to C40 (FIG. 6) of a bottom plane B10 of the polyhedron having the specified length X10 and width Y10; and four outward folding lines M10 to M40 each being formed to be in parallel with each of the four inward folding lines V10 to V40 with a distance therefrom equal to the specified height Z10.

In a region formed at each of four corners of the quadrilateral sheet S10 including each of the four corner points C10 to C40, the region comprises: two inward folding lines V50 and V60 (FIG. 7) being formed to extend from one of the corner points C10 to C40 to two of the ends G10 to G80 of the two of the four outward folding lines M10 to M40 near the corner point, respectively; one inward folding line V70 being formed to connect the two of the ends G10 to G80 of the two of the four outward folding lines M10 to M40 near the corner point; one outward folding line M50 dropped from the corner point C10, one of the four corner points C10 to C40, as a vertex P10 of a triangle T10, formed with the two inward folding lines V50 and V60 and the one inward folding line V70, to the one inward folding line V70 as a base so as to divide the triangle into two; two inward folding lines V80 and V90 each being formed to extend from each of the other two vertices P20 and P30 of the triangle T10 in parallel with one of the four outward folding lines M10 to M40 extended to the end as the rest of the other two vertices P20 and P30; and two outward folding lines M60 and M70 each being formed to extend from an end G90 of the one outward folding line M50 on the one inward folding line as the base so as to be in parallel with one of the four outward folding lines M10 to M40 extended to the one of the other two vertices P20 and P30 beyond the other of the two outward folding lines M60 and M70. In FIG. 6 and FIG. 7, the inward folding lines and the outward folding lines are represented by broken lines and solid lines, respectively.

The quadrilateral sheet S10 (FIG. 9A), comprising the above inward folding lines and outward folding lines shown in FIG. 6 and FIG. 7, is folded as described below.

The four inward folding lines V10 to V40 are folded inward and the four outward folding lines M10 to M40 are folded outward, and in each of regions at the four corners of the quadrilateral sheet S10, the two inward folding lines V50 and V60, the one inward folding line V70 and the two inward folding lines V80 and V90 are folded inward, and the one outward folding line M50, and the two outward folding lines M60 and M70 are folded outward, by which a package carton is obtained in a form before being completed (FIG. 9B). The above inward and outward folding is further carried out completely to completion of the package carton (FIG. 8 and FIG. 9C), which is formed with the four side planes SD10 to SD40 each connected by the triangle T10 folded in two on the bottom plane B10 of the polyhedron, four outward folding lines M10 to M40 each connected through the triangle T10 folded in two and a flat flange F10 extending from the outward folding lines M10 to M40 in the horizontal direction on all sides of the periphery.

Into the packaging carton thus formed, contents (not shown in the drawings) are put to be held with a sealing cover CP 1 (FIG. 10) applied over the contents and mounted on the flange F10 to be bonded thereto by, for example, fusing to constitute a sealed packaging carton in which contents such as food or drink are held.

Third Embodiment

In the embodiment, a packaging carton according to the present invention is made in a polyhedron by folding a quadrilateral sheet SS100 as shown in FIG. 11, FIG. 12 and FIG. 13. The package carton made in a polyhedron is formed to have a bottom plane B100 with specified length X100 and width Y100, a pair of facing long side planes SD100 and SD200 each with a specified long height Z100, a pair of facing short side planes SD300 and SD400 each with a specified short height Z200, two pairs of facing inclined side planes SD500 to SD800 each being in a form of a triangle T100 formed between the long side plane SD 100 or SD 200 and the short side plane SD300 or SD400 with one side S100 connected to the long side plane SD100 or SD200, one side S300 of the other two sides S200 and S300 connected to the short side plane SD 300 or SD400 and one vertex between the above sides S100 and S300 being at each of four corner points C100 to C400 of the bottom plane B100, and a flange F100 formed with a continuous face and provided around a periphery.

In order to make the package carton, the quadrilateral sheet SS100 comprises: two first inward folding lines V200 and V300 each being formed to pass two of four corner points C100 to C400 of a bottom plane B100 of the polyhedron having the specified length X100 and width Y100, and to have a length equal to a sum of the specified width Y100, twice the specified short height Z200, and twice a width FF100 of the flange F100; two second inward folding lines V400 and V500 each being formed to cross the two first inward folding lines V200 and V300 at right angles to connect two of the four corner points C100 to C400, and to have a length equal to the specified length X100; two outward folding lines M500 and M600 each being formed to have a length equal to the specified length X100 between two of the four corner points C100 to C400 and to be in parallel with one of the second inward folding lines V400 and V500 with a distance therefrom equal to the specified short height Z200; two pairs of inward folding lines V100 each line extending from each end of the second inward folding line V400 or V500 at one of the four corner points C100 to C400, and forming the one side S100 of the triangle T100 connected to the one of the long side planes SD100

and SD**200**; two pairs of outward folding lines M**700** each pair being formed to extend from both ends of each pair of the folding lines V**100** in parallel with the second inward folding line V**400** or V**500**; and two outward folding lines M**300** and M**400** each being formed to have a length equal to a distance between the two pairs of the outward folding lines M**700** and to be in parallel with one of the first inward folding lines V**200** and V**300** with a distance therefrom equal to the specified long height Z**100**.

In a region formed at each of the four corners of the quadrilateral sheet SS**100** between the long side plane SD**100** or SD**200** and the short side plane SD**300** or SD**400**, as shown in FIG. **14**, the region including the inclined side plane SD **500** as the triangle T**100** comprises: an inward folding line V**600** being formed to extend from the outward folding line M**500** having the length equal to the specified length X**100**, and being in parallel with the second inward folding line V**400**; two outward folding lines M**100** and M**200**, forming the other two sides S**200** and S**300** of the triangle T**100** as the inclined side plane SD**500**, drawn from a point P**100** as one of the other vertices at an end of the inward folding line V**600**; and an outward folding line M**800** formed to extend from the point P**100** as the one of the other vertices of the triangle in parallel with the first inward folding line V**200**. Therefore, such outward folding lines M**100**, M**200**, M**700** and M**800**, and inward folding line V**600** are also provided in the other three regions at the respective three other corners of the quadrilateral sheet SS**100** including the inclined side planes SD**600** to SD**800** (FIG. **11**).

In FIG. **11** and FIG. **14**, the inward folding lines and the outward folding lines are represented by broken lines and solid lines, respectively.

The quadrilateral sheet SS**100** (FIG. **15**A) comprising the above inward folding lines and outward folding lines shown in FIG. **11** and FIG. **14** is folded as described below.

The two first inward folding lines V**200** to V**300**, the two second inward folding lines V**400** and V**500** and the two pairs of the inward folding lines V**100** are folded inward, and the two outward folding lines M**300** and M**400**, the two outward folding lines M**500** and M**600** and the two pairs of the outward folding lines M**700** are folded outward. Further, in each of the regions at the four corners of the quadrilateral sheet SS**100**, the two outward folding lines M**100** and M**200** and the outward folding line M**800** are folded outward, and the inward folding line V**600** is folded inward, by which a package carton is obtained in a form before being completed (FIG. **15**B). Following this, the above inward and outward folding is further carried out completely to completion of the package carton (FIG. **15**C), which is formed with the four side planes SD**100** to SD**400** each connected by the triangle T**100** on the bottom plane B**100** of the polyhedron, four outward folding lines M**300** to M**600** each connected by the outward folding line M**100**, and a flat flange F**100** extending from the outward folding lines M**300** to M**600** and M**100** in the horizontal direction on all sides of the periphery. The four side planes SD**100** to SD**400** are formed so that the long side planes SD**100** and SD**200** have the specified long height Z**100** and the short side planes SD**300** to SD**400** have the specified short height Z**200**. This allows only portions F**100** of the flange along the long side planes SD**100** and SD**200** to be formed in parallel with the bottom plane B**100** with the other portions of the flange F**100** bent downward from the ends of the portions along the long side planes SD**100** and SD**200**.

Into the packaging carton thus formed, contents (not shown in the drawings) are put to be held with a sealing cover CP **100** (FIG. **16**) is applied over the contents and mounted on the flange F**100** to be bonded thereto by, for example, fusing to constitute a sealed packaging carton in which contents such as food or drink are held.

In the above explained quadrilateral sheet SS**100** shown in FIG. **11** and FIG. **15**A, each pair of the two pairs of outward folding lines M**700** which extend from both ends of each pair of the two pairs of the inward folding lines V**100** are provided at a distance equal to the specified width Y**100** from the other pair of outward folding lines so that the outward folding line M**700**, the inward folding line V**100** and the second inward folding line V**400** or V**500** are on a straight line. However, the present invention is not limited to this, and, as in the quadrilateral sheet SS**100**' shown in FIGS. **17**A and **17**B, each pair of the two pairs of outward folding lines M**700**' which extend from both ends G**100** and G**200**, or G**300** or G**400** of each pair of the two pairs of the inward folding lines V**100**' may be formed at a distance Y**200** smaller than the specified width Y**100** from the other pair of outward folding lines. In FIGS. **17**A and **17**B, since the inward and outward folding lines other than the inward folding lines V**100**' and the outward folding lines M**700**' are identical with those in FIGS. **11** to **15**C, they are denoted by the same numeral with the description thereof being omitted.

The quadrilateral sheet SS**100**' is folded in the same way as explained above to be provided as a packaging carton as shown in FIG. **18** and FIG. **19**. This provided packaging carton has a flange F**100** as a plane formed in parallel with the bottom plane B**100** with a length allowed to be shorter than that of the carton made by folding the quadrilateral sheet SS**100**.

Moreover, as in a quadrilateral sheet SS**100**" shown in FIGS. **20**A and **20**B, each pair of the two pairs of outward folding lines M**700**" which extend from both ends G**1100** and G**1200**, or G**1300** or G**1400** of each pair of the two pairs of the inward folding lines V**100**" may be formed at a distance Y**300** larger than the specified width Y**100** from the other pair of outward folding lines. In FIGS. **20**A and **20**B, since the inward and outward folding lines other than the inward folding line V**100**" and the outward folding line M**700**" are identical with those in FIGS. **11** to **15**C, they are denoted by the same numeral with the description thereof being omitted.

The quadrilateral sheet SS**100**" is folded in the same way as explained above to be provided as a packaging carton as shown in FIG. **21** and FIG. **22**. This provided packaging carton has a flange F**100** as a plane formed in parallel with the bottom plane B**100** with a length allowed to be longer than that of the carton made by folding the quadrilateral sheet SS**100**.

Fourth Embodiment

In the embodiment, a packaging carton according to the present invention is made in a polyhedron by folding a quadrilateral sheet SS**1000** as shown in FIG. **23**, FIG. **24** and FIG. **25**. The package carton made in a polyhedron is formed to have a bottom plane B**1000** with specified length X**1000** and width Y**1000**, a pair of facing triangular long side planes SD**1000** and SD**2000** each with a specified long height Z**1000**, a pair of facing quadrilateral short side planes SD**3000** and SD**4000** each with a specified short height Z**2000**, and two pairs of facing inclined side planes SD**5000** to SD**8000** each being in a form of a triangle T**1000** formed between the long side plane and the short side plane with one side S**1000** connected to the long side plane, one side S**3000** of the other two sides connected to the short side plane and

one of vertices between the above sides being at one of four corner points C**1000** to C**4000** of the bottom plane, and a flange F**1000** formed with a continuous face and provided around a periphery.

In order to make the package carton, the quadrilateral sheet SS**1000** comprises: two first inward folding lines V**2000** and V**3000** each being formed to pass two of four corner points C**1000** to C**4000** of a bottom plane B**1000** of the polyhedron having the specified length X**1000** and width Y**1000**, and to have a length equal to a sum of the specified width Y**1000**, twice the specified short height Z**2000**, and twice a width of the flange FF**1000**; two second inward folding lines V**4000** and V**5000** each being formed to cross the two first inward folding lines V**2000** and V**3000** at right angles, and to have a length equal to the specified length X**1000**; two outward folding lines M**3000** and M**4000** each being formed to have a length equal to the length of the second inward folding line V**4000** or V**5000** and to be in parallel therewith with a distance therefrom equal to the specified short height Z**2000**; and two outward folding lines M**5000** each formed to extend in parallel with the second inward folding line V**4000** or V**5000** from a vertex P**2000** of each of the pair of the triangles of the long side planes SD**1000** and SD**2000**.

In a region formed at each of the four corners of the quadrilateral sheet SS**1000** between the long side plane SD**1000** or SD**2000** and the short side plane SD**3000** or SD**4000**, as shown in FIG. **26**, the region including the inclined side plane SD **5000** as the triangle **1000** comprises: an inward folding line V**1000** forming the one side S**1000** of the triangle T**1000** connected to the one of the long side planes SD**1000** and SD**2000**; two outward folding lines M**1000** and M**2000**, forming the other two sides S**2000** and S**3000** of the triangle T**1000**, drawn from a point P**1000** as one of the other vertices at a distance from an imaginary extension of the second inward folding line being equal to the short height Z**2000** of the short side plane; an inward folding line V**6000** formed to extend in parallel with the second inward line V**4000** or V**5000** to the point P**1000** as one of the other vertices from an end of one of the two outward folding lines M**3000** and M**4000**; and an outward folding line M**6000** formed to extend from the point P**1000** as the one of the other vertices of the triangle T**1000** in parallel with the first inward folding line V**2000** or V**3000**. Therefore, such inward folding line V**6000** and the outward folding lines M**1000**, M**2000** and M**5000** are also provided in other three regions at the respective three other corners of the quadrilateral sheet SS**1000** including the inclined side planes SD**6000** to SD**8000** (FIG. **23**).

In FIG. **23** and FIG. **26**, the inward folding lines and the outward folding lines are represented by broken lines and solid lines, respectively.

The quadrilateral sheet SS**1000** (FIG. **27**A) comprising the above inward folding lines and outward folding lines shown in FIG. **23** and FIG. **26** is folded as described below.

The two first inward folding lines V**2000** and V**3000**, and the two second inward folding lines V**4000** and V**5000** are folded inward, and the two outward folding lines M**3000** and M**4000**, and the two outward folding lines M**5000** are folded outward. Further, in each of regions at the four corners of the quadrilateral sheet SS**1000**, the inward folding lines V**1000** and V**6000** are folded inward, and the two outward folding lines M**1000** and M**2000**, and the outward folding line M**6000** are folded outward, by which a package carton is obtained in a form before being completed (FIG. **27**B). Following this, the above inward and outward folding is further carried out completely to completion of the package carton (FIG. **27**C), which is formed with the four side planes SD**1000** to SD**4000** each connected by the triangle T**1000** on the bottom plane B**1000** of the polyhedron, two outward folding lines M**3000** and M**4000** each connected by the four outward folding line M**1000**, and a flat flange F**1000** extending from the outward folding lines M**3000**, M**4000**, and M**1000** in the horizontal direction on all sides of the periphery. The four side planes SD**1000** to SD**4000** are formed so that each of the long side planes SD**1000** and SD**2000** is in a triangle each with the specified long height Z**1000** and each of the short side planes SD**3000** and SD**4000** is in a rectangle with the specified short height Z**200**. This allows the flange F**1000** to have a form of being bent downward with each of the outward folding lines M**5000** taken as the central lines, namely, to be inclined planes.

Into the packaging carton thus formed, contents (not shown in the drawings) are put to be held with a sealing cover CP **1000** (FIG. **28**) is applied over the contents and mounted on the flange F**100** to be bonded thereto by, for example, fusing to constitute a sealed packaging carton in which contents such as food or drink are held.

In the above embodiments, when folding the sheet or film to make the tray carton it is possible to bond simultaneously the portions folded each other by fusion or adhesion with adhesives contained in the sheet or film per se. The folded ribs in the four corner increase the mechanical strength of the tray carton. The tray carton does not cause the liquid leakage because it relies on the folding of the sheet or film if it is used as a packaging carton for packing foods. The sheet or film is not cut, resulting in the effect to produce no chips of the carton blank for the better environment.

As is apparent from the above embodiments, the package carton according to the present invention can be provided to have a flat flange, on the upper face of which a sealing cover such as a transparent film can be bonded by fusion or adhesion with adhesives, so that it can be manufactured inexpensively and efficiently.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details can be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A packaging carton made by folding a quadrilateral sheet (S**1**) in a polyhedron having specified length, width and height (X**1**, Y**1**, Z**1**) with a flat flange (F**1**) provided around a periphery thereof, the quadrilateral sheet comprising:

four inward folding lines (V**1** to V**4**) each being formed to pass two of four corner points (C**1** to C**4**) of a bottom plane (B**1**) of the polyhedron having the specified length and width; and

four outward folding lines (M**1** to M**4**) each being formed to be in parallel with each of the four inward folding lines with a distance therefrom equal to the specified height, and to have a length equal to a distance between the two of the four corner points (L**1** or L**2**) on the inward folding line in parallel therewith, and

in a region formed at each of four corners of the quadrilateral sheet between two of four side planes (SD**1** to SD**4**) formed between the four inward folding lines and the four outward folding lines, respectively, the region comprising:

three outward folding lines (M**5** to M**7**) forming a triangle (T**1**) extending from a vertex (P**1**) at one of the corner points;

two outward folding lines (M**8** and M**9**) each being formed to extend from each of the other two vertices (P**2** and P**3**) of the triangle in parallel with one of the four outward folding lines forming the side plane beyond the rest of the other two vertices; and

two inward folding lines (V**5** and V**6**) each being formed to extend from an end (G**1** to G**8**) of one of the four outward folding lines forming one of the side planes to one of the other two vertices near the end.

2. A packaging carton made by folding a quadrilateral sheet (S**10**) in a polyhedron having specified length, width and height (X**10**, Y**10**, Z**10**) with a flat flange (F**10**) provided around a periphery thereof, the quadrilateral sheet comprising:

four inward folding lines (V**10** to V**40**) each being formed to connect two of four corner points (C**10** to C**40**) of a bottom plane (B**10**) of the polyhedron having the specified length and width; and

four outward folding lines (M**10** to M**40**) each being formed to be in parallel with each of the four inward folding lines with a distance therefrom equal to the specified height, and

in a region formed at each of four corners of the quadrilateral sheet including each of the four corner points, the region comprising:

two inward folding lines (V**50** and V**60**) being formed to extend from one of the corner points to ends (two of G**10** to G**80**) of the two of the four outward folding lines near the corner point, respectively;

one inward folding line (V**70**) being formed to connect the ends of the two of the four outward folding lines near the corner point;

one outward folding line (M**50**) dropped from the corner point (C**10**) as a vertex (P**10**) of a triangle (T**10**), formed with the two inward folding lines and the one inward folding line, to the one inward folding line as a base so as to divide the triangle into two;

two inward folding lines (V**80** and V**90**) each being formed to extend from each of the other two vertices (P**20** and P**30**) of the triangle in parallel with one of the four outward folding lines extended to the end as the rest of the other two vertices; and

two outward folding lines (M**60** and M**70**) each being formed to extend from an end (G**90**) of the one outward folding line on the one inward folding line as the base so as to be in parallel with one of the four outward folding lines extended to the one of the other two vertices beyond the other of the two outward folding lines.

3. A packaging carton made by folding a quadrilateral sheet (SS**100**) in a polyhedron formed to have a bottom plane (B**100**) with specified length and width (X**100** and Y**100**), a pair of facing long side planes (SD**100** and SD**200**) each with a specified long height (Z**100**), a pair of facing short side planes (SD**300** and SD**400**) each with a specified short height (Z**200**), two pairs of facing inclined side planes (SD**500** to SD**800**) each being in a form of a triangle (T**100**) formed between the long side plane and the short side plane with one side (S**100**) connected to the long side plane, one (S**300**) of the other two sides connected to the short side plane and one vertex between the above sides being at each of four corner points (C**100** to C**400**)of the bottom plane, and a flange (F**100**) formed with a continuous face and provided around a periphery, the quadrilateral sheet comprising:

two first inward folding lines (V**200** and V**300**) each being formed to pass two of four corner points (C**100** to C**400**) of a bottom plane of the polyhedron having the specified length and width, and to have a length equal to a sum of the specified width, twice the specified short height, and twice a width of the flange (FF**100**);

two second inward folding lines (V**400** and V**500**) each being formed to cross the two first inward folding lines at right angles to connect two of the four corner points, and to have a length equal to the specified length;

two outward folding lines (M**500** and M**600**) each being formed to have a length equal to the specified length between two of the four corner points and to be in parallel with one of the second inward folding lines with a distance therefrom equal to the specified short height;

two pairs of inward folding lines (V**100**) each line extending from each end of the second inward folding line at one of the four corner points, and forming the one side (S**100**) of the triangle (T**100**) connected to the one of the long side planes;

two pairs of outward folding lines (M**700**) each pair being formed to extend from both ends of each pair of the inward folding lines (V**100**) in parallel with the second inward line; and

two outward folding lines (M**300** and M**400**) each being formed to have a length equal to a distance between the two pairs of the outward folding lines and to be in parallel with one of the first inward folding lines with a distance therefrom equal to the specified long height, and

in a region formed at each of four corners of the quadrilateral sheet between the long side plane and short side plane, the region comprising:

an inward folding line (V**600**) being formed to extend from one of the two outward folding lines having the length equal to the specified length, and being in parallel with the second inward folding line;

two outward folding lines (M**100** and M**200**), forming the other two sides (S**200** and S**300**) of the triangle (T**100**), drawn from a point (P**100**) as one of the other vertices at an end of the inward folding line (V**600**); and

an outward folding line (M**800**) formed to extend from the point as the one of the other vertices of the triangle in parallel with the first inward folding line.

4. A packaging carton as claimed in claim **3** wherein each pair of the two pairs of outward folding lines being formed to extend from both ends of each pair of the two pairs of the inward folding lines (V**100**) are formed at a distance equal to the specified width (Y**100**) from the other pair of outward folding lines.

5. A packaging carton as claimed in claim **3** wherein each pair of the two pairs of outward folding lines being formed to extend from both ends (G**100** and G**200**, or G**300** or G**400**) of each pair of the two pairs of the inward folding lines (V**100'**) are formed at a distance (Y**200**) smaller than the specified width (Y**100**) from the other pair of outward folding lines.

6. A packaging carton as claimed in claim **3** wherein each pair of the two pairs of outward folding lines being formed to extend from both ends (G**1100** and G**1200**, or G**1300** or G**1400**) of each pair of the two pairs of the inward folding lines (V**100"**) are formed at a distance (Y**300**) larger than the specified width (Y**100**).

7. A packaging carton made by folding a quadrilateral sheet (SS**1000**) in a polyhedron having a bottom plane (B**1000**) with specified length and width (X**1000** and Y**1000**), a pair of facing triangular long side planes (SD**1000**

and SD**2000**) each with a specified long height (Z**1000**), a pair of facing quadrilateral short side planes (SD**3000** and SD**4000**) each with a specified short height (Z**2000**), two pairs of facing inclined side planes (SD**5000** to SD**8000**) each being in a form of a triangle (T**1000**) formed between the long side plane and the short side plane with one side (S**1000**) connected to the long side plane, one (S**3000**) of the other two sides connected to the short side plane and one of vertices between the above sides being at one of four corner points (C**1000** to C**4000**)of the bottom plane, and a flange (F**1000**) formed with a continuous face and provided around a periphery, the quadrilateral sheet comprising:

two first inward folding lines (V**2000** and V**3000**) each being formed to pass two of four corner points (C**1000** to C**4000**) of a bottom plane of the polyhedron having the specified length and width, and to have a length equal to a sum of the specified width, twice the specified short height, and twice a width of the flange (FF**1000**);

two second inward folding lines (V**4000** and V**5000**) each being formed to cross the two first inward folding lines at right angles, and to have a length equal to the specified length;

two outward folding lines (M**3000** and M**4000**) each being formed to have a length equal to the length of the second inward folding line and to be in parallel therewith with a distance therefrom equal to the specified short height; and

two outward folding lines (M**5000**) each formed to extend in parallel with the second inward folding line from a vertex (P**2000**) of each of the pair of the triangles of the long side planes, and

in a region formed at each of four corners of the quadrilateral sheet between the long side plane and short side plane, the region comprising:

an inward folding line (V**1000**) forming the one side (S**1000**) of the triangle (T**1000**) connected to the one of the long side planes;

two outward folding lines (M**1000** and M**2000**), forming the other two sides (S**2000** and S**3000**) of the triangle, drawn from a point (P**1000**) as one of the other vertices at a distance from an imaginary extension of the second inward folding line being equal to the short height of the short side plane;

an inward folding line (V**6000**) formed to extend in parallel with the second inward line to the point (P**1000**) as one of the other vertices from an end of one of the two outward folding lines (M**3000** and M**4000**); and

an outward folding line (M**6000**) formed to extend from the point as the one of the other vertices of the triangle in parallel with the first inward folding line.

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